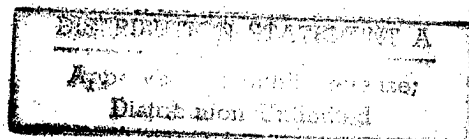


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# USSR Report

MILITARY AFFAIRS

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11 May 1984

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## MILITARY POLITICAL ISSUES

### VILNIUS PAPER REPORTS ZARUDIN ELECTION SPEECH

Vilnius SOVETSKAYA LITVA in Russian 21 Feb 84 p 3

[Rokishkis Article, Yal'ta: "Our Force in Unity"]

[Text] At the Regional House of Culture voters met with candidate for deputy of the USSR Supreme Soviet, Commander of Northern Group of Forces Colonel General and Hero of the Soviet Union Yuriy Fedorovich Zarudin. He is the candidate to the Soviet of Nationalities from Rokishkis Electoral District No. 247.

First Secretary of the Rokishkis Latvian CP Raykom Vitaliy Asachyev opened the meeting. He noted that the Soviet peoples, preparing for the elections, are uniting still more closely around the dear Communist Party and are unanimously approving the results of the special CPSU Central Committee Plenum.

The deputy candidate's agent in Rokishkis Secondary School No 2, teacher Galina Fitingova, acquainted meeting participants with Yu. F. Zarudin's biography and his services in strengthening the military power of the Soviet State.

Candidate for deputy of the USSR Supreme Soviet Yuriy Fedorovich Zarudin took the floor.

"Preparations for elections to the USSR Supreme Soviet is taking place in the environment of high political and labor activity by Soviet peoples and by the soldiers of USSR Armed Forces. In all corners of the Motherland of Many Nationalities, village workers and toilers and scientists are working intensively to implement the decisions of the 26th CPSU Congress. Soviet people unanimously approve the foreign and domestic policies of the Communist Party and its Leninist Central Committee.

The upcoming elections are an event of great political significance. They offer a distinct look at our democracy. The role of the soviets in our country's life is extraordinarily great and is continuously growing in proportion to the complexity of the tasks of communist construction. Everything achieved under the leadership of the Communist Party is closely tied to the activity of the soviet as an organ of state power."

Five years have passed since the last elections for the USSR Supreme Soviet. These were years of intense labor, of creative searches and persistent efforts to accomplish large-scale and complicated tasks advanced by the party.

Summing up this period, as the CPSU Central Committee appeal to voters and USSR citizens stresses, one can with good reason report to Soviet people that the political course developed by the party is steadfastly being implemented. Our Motherland is becoming even richer and stronger. The Leninist foreign policy, a policy of peace and security, is consistently conducted.

Yu. F. Zarudin spoke in detail about the unity of people and the army and the role of the country's Armed Forces in strengthening peace. The CPSU and its Central Committee are doing everything to provide peaceful life and work for Soviet peoples and the growth of our country's defensive capability so that the Motherland has sufficient means to defend its own interests and the interests of all its allies. The orator noted that the Armed Forces are a reliable shield for the Soviet Union, a powerful defender of socialist achievements, the peaceful labor of Soviet peoples and a pillar of total peace. Soviet soldiers are meeting their sacred duty of defending the Motherland and socialism's achievements in unity with the armies of Warsaw Pact countries.

Candidate for the USSR Supreme Soviet Deputy Yu. F. Zarudin cordially thanked everyone for their great trust and assured the voters that every effort and all energy would be given to strengthening the Armed Forces of the socialist Motherland and the friendship of fraternal Soviet peoples.

12511

CSO: 1801/259

## ARMED FORCES

### EDITORIAL ON IMPORTANCE OF BATTLEFIELD INTELLIGENCE OPERATIONS

Moscow KRASNAYA ZVEZDA in Russian 13 Mar 84 p 1

[Article: "Intelligence Operations on the Battlefield"]

[Text] It was 40 years ago in the environs of Korsun-Shevchenkivskiy. On the night of 17 February 1944 the command headquarters of the enemy's encircled grouping decided to undertake a final desperate attempt to escape from the cauldron. With a view towards this, the Hitlerists intended to use poor visibility, the snowfall and a blizzard. However, their calculations for a surprise fell through. Our command headquarters had taken all measures so that not a single Hitlerist would break out of the encirclement. In many respects, this was skillfully enhanced by organized intelligence operations which were continuously conducted by all subunits [podrazdeleniye] and were distinguished by purposefulness, activity, operativeness and accuracy of information on the objectives being reconnoitered.

One can't take a step without intelligence operations. This formula of the front commanders today sounds particularly important. In modern combat when opposing sides have at their disposal weapons of great destructive power, and are capable of performing deep and swift maneuvers and reorienting their efforts in compressed time frames, the importance of intelligence operations increases.

The requirements for organizing intelligence operations as one of the most important kinds of combat support are clearly defined by combat regulations and manuals. It is every officer's duty to know them thoroughly and, with regard to experience at the front, to creatively put into practice the distinguishing features of tasks being solved. In this sense, it comes from the fact that all subunits must be able to carry out intelligence operations skillfully.

Tactical exercises are the main school of intelligence training. As experience convinces, two-way exercises are particularly instructive in this plan. In the best way, they promote working out skills among officers to organize intelligence operations and to manage them in a firm manner under hostile conditions with an aggressive enemy, and they make it possible on a wider scale to attract the subunits of various arms and services and special forces for conducting intelligence operations. The entire complex of matters of intelligence operations concerning actual combat conditions is being mastered most completely in exercises of this kind.



At the same time, with a view towards improving the intelligence skills of personnel, it's also important to use ordinary studies in accordance with various kinds of combat training as, for example, they're doing in the "N" motorized rifle regiment (Southern Group of Forces). In particular, rifle training and tank and rifle training here, as a rule, are conducted in a dynamic, rapidly changing tactical situation. The soldiers learn to conduct intelligence operations on the battlefield through observing both by day and night and to determine the enemy's strong and weak points. It's completely natural that in past exercises in the regiment the personnel of a majority of the subunits showed solid skills in conducting intelligence operations at night.

Every soldier can have these and other qualities which are essential for intelligence personnel--good powers of observation, visual estimation and the ability to recall what is seen on the battlefield. But this is achieved only where matters of intelligence training of both regular and nonregular intelligence subunits and all personnel are constantly within eyeshot of commanders and headquarters. For example, they are acting properly in those units where assemblies, at which matters on special training are being worked out, are being held systematically with observers in subunits as well as with squads, crews and detachments intended for conducting radiation and chemical reconnaissance, and where the soldiers of motorized, tank and other subunits as well are being taught to conduct intelligence operations on the battlefield through various methods. During preparation for exercises, experienced commanders are conducting radio training and teaching their subordinates to work at communications equipment under conditions of interference, to use standard prearranged message codes and specially prepared cards, to rapidly and accurately determine target coordinates and to report intelligence information in a timely manner.

Unfortunately, this is still far from being done everywhere. Some commanders and headquarters are allowing a different kind of simplification and indulgence when organizing intelligence operations. Frequently the situation itself which is created in exercises does not confront commanders and headquarters with the necessity to conduct aggressive and continuous intelligence operations. They receive far more information beforehand than is possible in actual combat. Sometimes intelligence operations give evidence of sluggishness and they are not keeping pace with the swift development of events on the battlefield as, for example, which occurred recently during a tactical exercise in one of the regiments. Intelligence personnel under the command of Captain N. Shtuchko weren't able to provide the regimental headquarters with the necessary information since the commander of the intelligence subunit lost control of the forces and facilities available at his disposal.

At the present time, troops are equipped with modern technical equipment which allows commanders and headquarters to solve intelligence problems even beyond the bounds of the tactical zone of combat operations. But one cannot help but take into account also the growing possibilities for opposition to intelligence operations, disinformation and maintaining the secrecy of operations. All this requires from commanders and headquarters the skills to firmly control intelligence operations and to use all methods for conducting it. With a view to improving the necessary skills for this, it's necessary to more aggressively use the training of officers in a commander's training system. The practice of conducting combined tactical and drill studies in the subunits of various arms and

services and special forces also merits approval. They promote working out the skill among officers to comprehensively use the intelligence information being received both from their own intelligence organizations and from the intelligence operations of arms and services--artillery, chemical, engineer and so forth.

The methods of intelligence training require further improvement. It is necessary to more aggressively incorporate into practice the foremost experience available in this matter and to support in every way possible the sprouts of something new and long-range. As a matter of fact, the scope for showing a commander's creative work, initiative and ingenuity is particularly broad in intelligence operations. In this plan, competitive matches in intelligence operations conducted both in intelligence and in motorized rifle, tank and other subunits can provide a great deal to officers and all personnel. It's essential to train them thoroughly, to carefully study the experience of the winners and to make it in a practical way the property of everyone.

Experience at the front teaches that to a decisive degree the effectiveness of intelligence operations depends on the moral and combat qualities of personnel which are fostered through daily, purposeful party and political work. While organizing work with various categories of military service personnel, commanders, political organs, and party and Komsomol organizations it is necessary to pay particular attention to intelligence personnel. The fostering among them, as well as among all personnel, of high volitional and physical qualities, initiative, independence and the ability to correctly evaluate the situation on the battlefield and to orient themselves in it, and striving always to search for and find the best methods for solving the tasks which have been set are one of the most important trends in this work.

Raising the intelligence training of personnel to a new stage and arming commanders and staff officers with stronger skills in organizing intelligence operations on the battlefield mean are meant to achieve a further increase in the combat readiness of the forces.

9889

CSO: 1801/283

ARMED FORCES

CALL FOR WW II OFFICER'S NAME TO BE CLEARED

Moscow KRASNAYA ZVEZDA in Russian 10 Mar 84 p 4

[Article by special KRASNAYA ZVEZDA correspondent Colonel A. Khorev: "The Shadow on a Good Name"]

[Text] "I like to reach the very essence in everything.

In work, in searching for a path, in a heartfelt disturbance.

To reach the essence of days past,

To reach their motives,

To reach the foundations, the roots,

To reach the core."

Valentin Aleksandrovich Kovalev, a civil aviation engineer from Kharkov, concludes his letter to the editorial office with these verses of a well-known poet. He calls them not without basis his motto. For several years already, and with enviable persistence, this person has been collecting information a grain at a time about the naval service of his father Senior Lieutenant Valentin Aleksandrovich Martynov who did not return from the war. Fate chose to preserve for his son only his first name--Valentin--in memory of his own father. His stepfather gave him his patronymic and last name. Valentin was only two months old when Senior Lieutenant Martynov, who was bound for temporary duty abroad on a supply ship of the allies to obtain ships, was killed as the result of an attack on the supply ship by enemy submarines. This happened on 30 April 1944 in the area of the island of Medvezhiy.

The details of his father's death became known to Valentin only recently after he had read quite a number of publications about the combat operations of our navy during the war years, had become familiar with several documents in the central military naval archives, had established the addresses of many veterans who served in the 1941-44 period along with his father on submarine K-21, and he had met them.

A book of memoirs by a well-known but now deceased North Sea submariner gave Kovalev his first impetus for the search. For the first time, he encountered the last name of his father in it in this kind of context: "K-21 departed Pol-yarnyy on 18 June. Navigation was difficult--the unfading polar day, the calm sea and aircraft every now and then emerging from behind the clouds. On the second day of the trip one of those aircraft caused a lot of trouble for the submarine. The watch commander Lieutenant Martynov was late with the crash dive and 2 bombs fell about 30 meters from the side of K-21, and a machine gun burst lashed along the lightweight hull. The trimming of the submarine turned out to be disturbed. Water began to penetrate into the first equalizing tank and into the rapid dive tank. They could do little more than return to base."

Of course, information such as this couldn't be pleasant for the son: if his father's negligence didn't show him in an unfavorable light, then in any case it didn't embellish him either. But Valentin sensibly considered this to be nothing more than an episode, and his father was at war for almost three years as a crew member of the famous submarine, so his combat biography is far from being reduced by this. Beginning the search, he expected first of all to confirm this hope of his. And soon afterwards he indeed confirmed it, one might say, in the most authentic and best way: the archives gave this information--the commander of the steering group of submarine K-21 and from September, 1943 the commander of BCh-1 of this very boat Senior Lieutenant V. A. Martynov was decorated with the Orders of the Red Banner and the Red Star for participating in the sinking of an enemy ship and torpedoing the battleship "Tirpitz." His son also wanted to find some kind of living and detailed confirmation with a plot of his father's courage in the rather numerous literature about the submarine on which he served, but for the time being this wish of his didn't come true. The authors of the publications, as if having an agreement among themselves, importunately paint one and the same picture of the negligence which allegedly occurred on 19 June 1942.

/Judging by available information, in its issue of 10 December 1960 the Northern Fleet's newspaper "NA STRAZHE ZAPOLYAR'YA" was the first to publish this version. Then it repeated it again on 6 April 1969.

In 1970 the journal "ZVEZDA" published V. Pikul's novel "Convoy RQ-17." The episode here has already become overgrown with a number of details. "Martynov's voice rang out completely unexpectedly from the bridge:

'Pass a request to the commander to come out on the deck.'

Lunin's voice was heard:

'And to hell with you and your politeness!'

Lunin approached the depressed Lieutenant Martynov:

'Well, lieutenant! All that confusion and it's on your conscience.'"/ [in boldface]

Later on, V. Pikul's novel was reprinted time and again under the title "Requiem for Convoy RQ-17" with an author's note under the heading: "A Documentary Tragedy." And now it appears in the "novel and newspaper" plan for 1984.

In 1978 the Military Publishing House of the USSR Ministry of Defense published M. Khametov's book "Heroes of the Underwater Depths" and in 1980 it published the military historical essay of a group of authors "In the Very Cold Depths." Both in those and in other publications they couldn't manage without an episode with Martynov. Well frankly, there's always a way out in it! Everywhere Lieutenant Martynov is appearing in one and the same unenviable role and is being given a good scolding by the submarine commander Lunin. And nothing more is being communicated to the reader about Martynov. One can understand it this way: there's no use talking about it any more. Unless maybe in addition, as the newspaper "NA STRAZHE ZAPOLYAR'YA" writes, the commander and the commissar "looked into this occurrence of Lieutenant Martynov's indecision and lack of independence in making crucial decisions." You concur that "indecision and a lack of independence" are already a label.

Of course, as is well known, it isn't necessary to speak poorly of the dead. And, what's more it's said, they also can't be hurt. But how hard is it for Martynov's son from reading fiction such as this? It's termed first historical and then documentary, but--and this is the whole point!--the episode with Martynov, it turns out, is not corroborated by documentation, but rather is refuted. The logbook of submarine K-21 is kept in the central military naval archives and from which it follows that Martynov did not have watch duty on 19 June 1942 and other commanders took it by turns. One of them, F. Luk'yanov who is now already deceased, wrote this in the sketches "Attack on the 'Tirpitz'" which were published by the Pacific Ocean Fleet's newspaper "BOYEVAYA VAKHTA:"

/"My birthday was on 19 June and the commander wished me a happy 29th birthday. The commander had no sooner congratulated me on my birthday than somewhere from beyond the clouds on high aerial bombs began to rain down upon us one after another. This time I was somewhat late with the crash dive: I tried to determine who in the world was bombing us. And these few seconds of delay became the subject of special analysis in the conning tower."/ [in boldface]

Wasn't this very episode which was colored brightly with epithets and dialogues subsequently attributed to Martynov and didn't it begin to roam from one publication to another? Mikhail Aleksandrovich Leoshko, the former commander of combat navigation matters on submarine K-21, regards such a version as possible and he thinks that V. Pikul' should have amended his book.

Another veteran of submarine K-21, the former commander of a torpedo group Vasily Mikhaylovich Terekhov, also expresses his opinion for excluding this episode from subsequent books.

/Unfortunately, some of Martynov's former colleagues take a position in this matter which one can't help but call strange. While answering an inquiry of the editorial office, one of them writes: "I think such an incident in Martynov's service is possible. While it could have occurred on 19 June 1942 or at some other time, it also could have been not just Martynov but some other officer too and this isn't a crime, and it isn't even a mistake; an action such as this is provided for by regulations. Why does the incident with Martynov cause such indignation among his relatives? Why can't one regard it as conceivable that Martynov could have substituted for the watch officer? The authors also could have

erred in determining this date. The story about the incident with Martynov which was cited in the works of V. Pikul' and M. Khametov created a great deal of popularity for Martynov and by no means disgraces him."/ [in boldface]

/And it goes on and there's more: "What mistake are we talking about? About the fact that the incident with Martynov dates from 19 June and the logbook doesn't confirm his being on the watch? And, perhaps, this incident on the boat never occurred at all, but the author decided to brighten up the text and invented this incident." This is what it can come to and I have reasoned it according to the well-known principle "I'll make a helpless gesture concerning someone else's misfortune."/ [in boldface]

Well, just what do those who did the writing themselves think on this account? Now you can't ask those who no longer are among the living. But what about those who are well and who could correct the mistake?

The author of one of the books which was mentioned and a worker at the Military Publishing House Captain 1st Rank M. Khametov more or less realistically evaluates what occurred. He is responding to a complaint from Martynov's sister, who is conducting her own search simultaneously with Kovalev's, that in the event of re-printing or publishing new books about the Northern Fleet's submariners the version about Martynov's mistake be omitted and a good word be said about this deserving naval officer. However, Khametov also isn't taking any real steps whatever towards correcting the error.

The writer V. Pikul' is displeased and angry with the complaints of Martynov's relatives. He answered our inquiry in a very irritated tone of voice:

/"For three years now citizen Martynova has been accusing me as though I distorted the truth about her brother Lieutenant V. A. Martynov and was the first one in the USSR to speak a falsehood about him.

I remind you of the dates. I wasn't the first one in our country to write about Martynov's fatal indecision, but it was a well-known veteran submariner as far back as 1964, and my 'Requiem for Convoy RQ-17' only appeared in print in 1970. Lieutenant Martynov, whom his sister is defending so passionately, RUINED THE ENTIRE OPERATION.

I also used the publication in the Northern Fleet's newspaper 'NA STRAZHE ZAPOL-YAR'YA' under the headline 'The Followers of Lunin' in the work. An eyewitness judges Martynov still more severely and he specifically speaks about 'Lieutenant Martynov's indecision and lack of independence,' and through the fault of whom the heroic K-21 was almost lost.

Finally, the Military Publishing House recently (in 1980) published the monograph 'In the Very Cold Depths.'

It would appear that everything is clear by now. Historians of the last war are not using my novels for their conclusions. It's absurd and ridiculous to think as though the entire scientific collective of authors copied historical facts from my novel."/ [in boldface]

As we view it, writer V. Pikul' reduced the whole problem to the fact of who is copying from whom. And as a matter of fact, it turns out that, while not consulting archival documents, in reality they are shamelessly copying from each other! Having reevaluated their memory, one inadvertently makes a mistake and the others irresponsibly circulate his error. And it's as if nobody cares about the insulted feelings of the heirs of the officer who was killed in combat and about considerations concerning regard for the honor and dignity of the officer himself.

And of course the editorial office of the newspaper "NA STRAZHE ZAPOLYAR'YA" couldn't or didn't want "to come to the point." In its reply to Martynov's sister it demonstrates striving at all costs to justify the error which was committed. For example, it is clinging to the fact that the date when the ill-fated incident precisely occurred was not named directly in the 1969 publication. But on the other hand it says in it that Lieutenant Martynov started work on the top watch in the day following the commencement of the voyage. And the voyage began on 18 June--this is fixed in a publication of the same newspaper on 10 December 1960 and where, strictly speaking, the whole "confusion" began. The question arises of why make it vague when the arithmetic is simple.

Further in the letter to the editorial office it says: "At the same time we wish to note that a similar incident (with whomever it occurred) doesn't to any degree cast aspersions on a follower of Lunin. If one can say so, this is an operating feature of sea navigation." Perhaps it's an operating one all right, however, it's fraught with great consequences. Suddenly we see it! This is precisely what Pikul' is driving at: through the fault of Martynov "the heroic K-21 was almost lost." There is logic in these judgements and so other readers have a right to judge. Is it pleasant for Martynov's son to hear such commentaries on the episode which was attributed to his father? (Incidentally, in later publications about Martynov's episode they began to call him "assistant watch commander." But this version too, as they informed us from the archives, is not confirmed by documentation).

The editorial office of "NA STRAZHE ZAPOLYAR'YA" further assures Martynov's relatives that the lieutenant's name for North Sea sailors is associated with courage, heroism and loyalty to military duty. Very well! But why couldn't a newspaper which is called upon to propagandize combat traditions in every way possible back their words with an appropriate publication about Martynov on its pages, and why couldn't it take the humane initiative itself to protect his good name from further defamation in reprinted books containing unconfirmed information about him? Alas, the editorial office doesn't see beyond the remoteness of time (!) and "neither the grounds nor the point for raising a conversation about this unimportant episode." It's certainly true, as the saying goes, a tooth doesn't ache when it's behind someone else's cheek. Very likely everything in this episode would have quickly assumed a different coloration if the comrades would have tried mentally to put their fathers in Martynov's place and themselves in the present situation of his son.

As far back as July, 1983 the deputy commander of the navy political directorate Rear Admiral E. Zimin informed Martynov's sister Nina Aleksandrovna about the fact that the editorial office of "NA STRAZHE ZAPOLYAR'YA" was given instructions

to prepare and print material in connection with the publication in April, 1969 in which the inaccuracy was committed in determining the blame for the episode which took place on 19 June 1942. However, the editorial office continues to see "neither the grounds nor the point." How can one comprehend this?

Once again this sad story reminds one of the special responsibility of authors who are writing on military and historical subjects. It shows as well how diffuse at times notions about feelings of honor and dignity can be.

A. S. Pushkin's majestic lines from the poem "My Family Tree" are most likely unforgettable for everyone:

"My forefather Racha served Saint Nevskiy with military muscle."

And did you happen to think about what a time interval separated Pushkin from Nevskiy? That's 600 years! Just how many generations have been replaced? And after such a period of time the great descendant was publicly proud of his ancestor and his service to the motherland. Here's a classic example of understanding family honor! Is it possible against such a background to be puzzled as regards the fact that a son--not a grandson, not a great-grandson, but one's own son--takes the trouble to remove an undeserved blemish from his father's reputation? Rather one could be expected to be troubled and surprised if he were to remain indifferent to this.

We the people of a rising class are directed by this very story to look ahead to the ages and see. For us the consciousness of proper pride, according to Marx's well-known expression, is more important than bread. And it doesn't become us at all to treat the good name of a person with disdain.

Particular punctiliousness, heightened a hundredfold, is necessary now in our regard for those who didn't return from the war. Among the thousands of our most unassuming heroes they are the most silent and the most unpretentious. They won't say anything either in their own praise or in their own defense. We the living must do everything for them. But sometimes we keep silent when we need to raise our voice for the honor of those who fell in battle and, on the contrary, we loosen our tongues now and then when it's out of place.

As is well known, nobody is insured against a mistake. And an honest regard for it is not contraindicated for anybody--admission, apology and correction. Isn't it strange that our authors, who spread through vast circulation and who are continuing to spread a lot of nonsense about an honored naval combat officer, found themselves so far away from this position? Did they really forget how to respect a person's dignity? Will they really not acknowledge that in our country it's protected not only by morals, but also by the law?

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## ARMED FORCES

### LETTERS TO KRASNAYA ZVEZDA EDITOR, RESPONSES

#### Slow Response by Commissariat

Moscow KRASNAYA ZVEZDA in Russian 14 Mar 84 p 2

[Letter to the editor by Capt V. Mamayev: "Indifference Encountered"]

[Text] Private A. Baygabylov had not received a single letter from his mother at home during his several months at the training subunit (podrazdeleniye) even though he wrote her regularly. Just what had happened? Perhaps his mother was ill and unable to write? The soldier turned to the subunit commander for advice. It was then that an inquiry went out to the Dzhety-Oguzskiy Rayon Military Commissariat of Issyk-Kul Oblast.

However, an answer did not follow. Private Baygabylov soon left for another unit (chast'). Here he turned to political worker Major A. Yepkin with the same request: help him find out what had happened at home. Two inquiries were sent out from the unit on the same day: one to the Dzhety-Oguzskiy Rayon Military Commissariat and the other to the rural soviet in the territory where the soldier's mother lives. Time went by and there was not a word in response.

A month later the unit commander sends another inquiry, this time to the Issyk-Kul Oblast military commissar. And only after this did the Dzhety-Oguzskiy Rayon Military Commissariat finally send a reply to the unit. It turns out that Private Baygabylov's mother really was seriously ill.

You read the few lines sent from the rayon military commissariat and think: just how much time did its workers need in order to find out the situation in the serviceman's family! Very little, for sure--to pick up the phone and call the rural soviet. Just why did they take so long in answering? In my opinion, here we encountered indifference, if not heartlessness, toward a person the rayon military commissariat sent off to military service not too long ago.

#### Negligence and Waste

Moscow KRASNAYA ZVEZDA in Russian 17 Mar 84 p 2

[Response to letter to the editor by Col A. Drovosekov: "Pallets and Travel Costs"]

[Text] Colonel A. Drovosekov's remarks, published under such a headline on 25 November 1983, spoke of the departmental discrepancies and unreasoned decisions which resulted in eight railroad flatcars with pallet cars for wall panels travelling uselessly throughout the country.

Engineer-Major General L. Shumilov informed the editorial staff that these irrational shipments were the result of careless execution of official duties by Engineer-Colonels A. Botin and Yu. Yefremov as well as insufficient monitoring on the part of Engineer-Major General A. Borovtsev.

All the named officials have been punished disciplinarily. In addition, one-third of comrades Botin's and Yefremov's pay has been withheld in partial compensation for the loss suffered by the state.

By decision of the party commission, CPSU member Yu. Yefremov has been awarded a reprimand and CPSU member A. Borovtsev has been admonished. The personal affairs of CPSU member A. Botin will be examined after his recovery. Communist Engineer-Colonel A. Ivanov, having allowed the negligence in drawing up the order for making the onboard rigging for the pallets, was heard at a session of the unit's (chast') party committee where he was given strict orders.

The newspaper publication was discussed at a conference of management personnel.

#### Family Affairs Slighted

Moscow KRASNAYA ZVEZDA in Russian 6 Mar 84 p 2

[Response to letter to the editor by L. Chigorenko: "Don't Avoid the Issue"]

[Text] Such was the title of L. Chigorenko's material carried in KRASNAYA ZVEZDA on 20 October 1983. As Major General A. Baskakov, member of the Military Council and chief of the Air Force political department of the Far East Military District, informed the editorial staff, the criticism is recognized as just. Some political workers arriving at the unit (chast') in question have indeed been little interested in the activities of the wives' council, considering the work with families of servicemen in that garrison to be at the proper level.

It has been planned in all political organs and party organizations to discuss the status of work among families of servicemen and measures for further improving it, in light of the requirements of the Main Political Directorate of the Soviet Army and Navy. Meetings of servicemen's wives are scheduled to be held, with mandatory participation by command and political management personnel of the Air Force district. It has been decided in the political department of the Air Force district to hear officers V. Pankratov and N. Korostelkin on questions of further improving work with family members of servicemen. It has been recommended that unified political days be organized regularly for the families.

## Shortcomings in Political Work

Moscow KRASNAYA ZVEZDA in Russian 20 Mar 84 p 2

[Response to letter to the editor by Major N. Khaust: "What's Behind the Usual 'Basically'?"]

[Text] A critical letter from Major N. Khaust was carried under such a headline on 29 November of last year. Analyzing the course of the reports and election meeting in the Tank Regiment imeni Leninskiy Komsomol, the author wrote that the meeting overlooked many key issues. Cases of nonfulfillment of socialist obligations by certain communists, formalism in ideological and educational work and omissions in discipline did not get proper evaluation.

As Major General B. Kudinov, first deputy chief of the Red Banner Belorussian Military District Political Department, informed the editorial staff, the article has been discussed at the official command conference of the unit (soyedineniye) and unit (chast'), in the political department and in the party committee of the regiment. Specific measures have been outlined and are being implemented to eliminate the shortcomings noted by the newspaper. Political workers of the unit's (soyedineniye) political department and of the district's political directorate rendered practical assistance in planning and organizing the ideological and educational process and political studies in the regiment and in improving socialist competition. Work in the unit (chast') on heroic-patriotic education of personnel and involving veterans in it has intensified.

There also was a response to the newspaper article from political worker officer G. Butorin who, caring more about "regimental honor" than a business-like attitude toward criticism, unfortunately missed the essence of the issues raised in the article.

## Slipshod Housing Construction

Moscow KRASNAYA ZVEZDA in Russian 11 Mar p 2

[Article by KRASNAYA ZVEZDA correspondent Ye. Sorokin: "...But the New Tenants Finish the Job"]

[Text] It is a picture familiar to everyone and even usual: the builders turned over the house and left. The new tenants arrived and all sorts of troubles begin.

But generally they are joyous and well they should be, for they have moved in and are settling down into a new, well-built apartment. In their hearts it is a festive occasion and they wish to say some warm words of gratitude to the builders. The letters from G. Smyslovaya of Moscow, Z. Klimchenko of Tula Oblast and others are examples of this. Of course, not every such new tenant writes to the editor. It is a natural thing: a well finished apartment is the norm. That is precisely what the majority of those who cross threshold of a new home receive.

However, judging by the letters to the editor, some new settlers endure far from festive troubles and their idyllic mood is frequently replaced by the prosaic need to roll up their sleeves and work. Just what in these "unfortunate" houses does not suit the holders of orders for apartments? Are the demands of the new settlers too great? We will let them speak for themselves.

"In late June 1983," A. Zanin and other members of the housing committee of a garrison in the Odessa Military District write KRASNAYA ZVEZDA, "we had a 50-unit apartment house turned over for operation. Orders for occupancy were let on 5 August. It is hard to believe what appeared before the eyes of the new tenants. There was no glass in many of the apartment windows and the wallpaper had fallen from the walls. Not a single door closed tightly, the floors had cracked and were 'breathing' and the sinks were barely supported. Not to mention the defective gas hot-water heaters, leaky faucets and the receptacles protruding from the walls. In short, repairs had to be made immediately after moving in. All of us new tenants are deeply disturbed by the fact that such careless workers are encountered in the ranks of military builders, whose labor merits nationwide respect."

We will say frankly that such letters to the editor are not isolated cases, especially in the beginning and middle of the year. Why at precisely this time? We became interested in how living quarters erected by military builders are turned over for operation. It turned out that three to four times as many dwellings are turned over at the end of the year than in the beginning of the year. It is evident that they had to rush and do finishing work hastily.

I recall a conversation with one of the responsible officials of the billeting services. "I mentally plan work not for a year but for 15 months," he said, "because the first quarter of the year is the time when builders are clearing up unfinished work, that is, new quarters formally accepted into operation are vacant. Some of our contractors have a tendency to increase this period: they may prepare houses for occupancy by June or even August."

That is why the question A. Vasyuta from Poltava Oblast poses in her letter sometimes comes up: "Recently my daughter and her officer husband moved into a new apartment. I visited them at their new home in Moscow Oblast and was astounded. Had the inspection commission even been in the house at all? If it had, did it really not notice that the doors were warped, the gas was not hooked up and the walls were colored with some sort of stains?"

The same question was in letters from Ye. Aksenovaya from Astrakhan (for example, hot water runs to the toilet, the electric stove is broken down, the floors are collapsing and the door jams are falling), Ustinovaya and others from the Chelyabinsk Oblast (they did not have water and lights in their homes until a month after moving in).

Sometimes it comes down to people with orders in hand waiting months for the flaws to be corrected. "Our house was accepted into operation in November. Orders were then given out. We did not move in until February of the following year. But we would have been much better off had we continued to live in the old apartments--the builders left so many kinds of imperfections behind them."

--writes L. Ruzavina from Kaliningrad Oblast. "We received orders in May and did not move in until October; the house was essentially unfinished," Lieutenant Colonel (Retired) A. Avdoshin says in his letter. "We had received the orders and could not move into the new house for a whole 3 months," complains N. Plyushchev of Kronstadt. "The builders had not left yet."

In their stress on production volume, rather than on quality, the builders sometimes turn over houses that are vacant for a year and longer. Either the water is not hooked up, or the boiler-room capacities are insufficient, or the elevators do not work. The occupants of No 1a, Dzerzhinskaya Street in Poltava, A. Boyko, Yu. Shcherbina and others report that they have hot water once every 2 weeks and that it is cold in the apartments. The subcontract organization headed by officer G. Maliyev has not done its work and the house, as we see, is already occupied. Similar facts are also the subject in letters from M. Kutsevaya, L. Borzovaya and others from the Odessa Military District and V. Voronin from the Moscow Military District.

Attempts by the occupants to influence the builders and get them to eliminate the defective output are often unsuccessful. Then the new tenants procure the missing faucets, insulate the doors and window frames and finish painting what the builders did not. Naturally, some in this manner and others differently, but always at the expense of their own free time and making material outlays, not to mention the morale costs.

It is not only quality that decreases during haste. Worse than that, some of the houses are generally being accepted incomplete. It appears that state commissions in a number of places continue to fulfill their functions poorly and look at the glaring imperfections through rose-colored glasses.

When you encounter this, you cannot help but wonder: What makes the members and the chairman of the commission act against their conscience and show signs of unscrupulousness? After all, they must know that by acting this way they are breaking the law and that the commission was established in order to demand, in the name of the state, the proper quality and to fight against slipshod work.

There are many reasons: both objective and subjective. But most often it is pressure from those who need the dwelling input plan at any cost, even by additions to reporting. Apparently, the fear of responsibility for nonfulfillment of the plan or a burning desire to be distinguished in a report sometimes turns out to be stronger than the voice of their conscience and sense of duty to people.

Improving the quality of housing construction cannot be done overnight, of course. But the formal acceptance of unfinished houses into operation must be stopped everywhere. For this, possibly, it is worth thinking a little so that the work of the inspection commissions involves representatives of the State Examination and Inspection Commission of the USSR Ministry of Defense and also of the Central Finance Administration.

Shutting one's eyes to slipshod work and open waste, in addition, teaches the builders to think that the practice of so-called construction flaws is

unavoidable. Here, one would think it appropriate to remember that low quality is not only a violation of norms and standards. Quality is, above all, an ethical category. Due to the irresponsible and indifferent attitude and carelessness or negligence of those who tolerate the waste, the words "made by military builders" sometimes take on an ironic nuance.

How can we fight this? Certainly some admonishments seem indispensable. Too often administrators of construction organizations justify themselves by wordy explanations and by listing "objective" reasons for the low quality of work. However, as it was emphasized at the December (1983) CPSU Central Committee Plenum, explanations are not what is needed but a real improvement of matters in construction. Here there is only one way--to increase responsibility of personnel and demands on them for irreproachable performance of duties, accuracy and initiative, and absolute and qualitative fulfillment of production plans.

It is precisely such a party-styled, exacting, state approach to the matter that is a guarantee that the grounds for the grievances of new tenants will disappear and the labor of the military builders erecting the housing facilities in the winter cold, heat and rain, will evoke only respect and gratitude.

#### Red Tape Encountered

Moscow KRASNAYA ZVEZDA in Russian 11 Mar 84 p 2

[Response to letter to the editor by Col A. Drovosekov: "Looking After...an Award"]

[Text] The critical letter from Colonel A. Drovosekov, carried under such a headline on 1 February, tells about the bureaucratism permitted by Major V. Deryugin, Shostkinskiy Rayon Military Commissariat worker, with regard to G. Vashchina, a participant of the Great Patriotic War.

The facts cited in the letter are true, Colonel N. Dunayev, Sumy Oblast Military Commissar informed the editorial staff. The newspaper article has been discussed in all the collectives of the military commissariats of the oblast and in party organizations of the military commissariats. Communists closely analyzed the state of affairs in the localities at meetings held amidst irreconcilability toward acts of bureaucratism, callousness and indifference in reviewing letters and receiving visitors. The correspondence has also been discussed at the official conference with city and rayon military commissars held by Major General A. Poporov, chief of the personnel directorate of the Kiev Military District.

CPSU member Major V. Deryugin has been made answerable for the permitted red tape, bureaucratism and indifference with regard to reserve and retired servicemen and for presenting false information to the oblast military commissariat concerning the presentation of the medal to G. Vashchina. By order of the commander, Kiev Military District, he has been removed from his position. Major A. Tregub, acting Shostka City Military Commissar, has been warned about the

incomplete official compliance. Other officials have been punished by this order. Measures have been taken to strengthen control over the timeliness and correctness of reviewing letters and complaints coming to oblast military commissariats.

#### Wrongful Loss of Apartment

Moscow KRASNAYA ZVEZDA in Russian 15 Mar 84 p 2

[Response to letter to the editor by Lt Col V. Makhov: "Ordered to Give Up Apartment"]

[Text] On 20 December of last year, a letter from Lieutenant Colonel V. Makhov and the commentary on it were carried under such a headline. The point was that upon the officer's leaving for service in one of the groups of forces, he was forbidden to reserve the apartment he occupied in his former place of duty in the Central Asian Military District.

As Colonel of Justice A. Khalyuchenko, temporarily acting district judge advocate, informed the editorial staff, a procurator's audit was conducted in connection with the newspaper article. A number of cases have been ascertained where servicemen leaving on temporary foreign duty were illegally ordered to give up their occupied quarters. The commander of the district as well as other officials have been informed of the illegality of such orders. Steps have been taken against similar violations in the future. Lieutenant Colonel V. Makhov has been given an apology and a pledge to be given out of turn an apartment of equal value upon returning to Alma-Ata from temporary duty.

#### Misuse of Position

Moscow KRASNAYA ZVEZDA in Russian 15 Mar 84 p 2

[Response to article by Capt 1st Rank V. Vorob'yev and Capt 2d Rank A. Zlydnev: "Father-in-Law in the Senior Assistants"]

[Text] Such was the title of the satirical article by Captain 1st Rank V. Vorob'yev and Captain 2d Rank A. Zlydnev, carried on 2 December 1983, about Engineer-Captain 2d Rank G. Antonyan who used his position for mercenary purposes and violated party, legal and moral norms. As Vice Admiral N. Shablikov reported to the editorial staff, Captain 2d Rank G. Antonyan has been relieved of his post and demoted for shortcomings in the style and methods of work and for abuse of his official position.

The editorial staff also received a response signed by Rear Admiral A. Slavskiy, first deputy chief of the Red Banner Pacific Fleet Political Directorate. It reports that a commission of the political directorate was working on the ship headed by Engineer-Captain 2d Rank G. Antonyan with participation by representatives of the judge advocate, finance and engineering services and the technical directorate of the fleet. The administration, party committee and trade-union committee of the ship repair enterprise have been ordered to take the necessary measures to normalize the situation on the ship. The political

department has been advised to implement a series of measures for increasing the level of party and political work and for fostering in communists of the ship a sense of responsibility for carrying out the assigned tasks. It has also been ordered to consider the question of instituting party proceedings against communist G. Pirvelya.

#### National Pride

Moscow KRASNAYA ZVEZDA in Russian 2 Mar 84 p 4

[Editorial: "KRASNAYA ZVEZDA's Mail"]

[Text] The editorial staff received 24,333 letters during February 1983 and 406 of them were published in the newspaper. There were 579 responses to these articles in KRASNAYA ZVEZDA.

"One day in the 'Lesson on Courage' in school, I was asked if I felt that I was a happy person. The question did not seem surprising for me and I answered it as best as I could, as my heart prompted.

During the Great Patriotic War I had the occasion to fight from its first to final day. My youth turned out to be fiery and singed with gunpowder. I lost many front-line friends from my unit in attacks at Smolensk, in battles with the enemy at the Kursk Bulge, in forcing the Dnieper, in the Carpathian passes and in liberating Budapest, Vienna and Prague from the Hitlerite invaders. My memory retains vivid images of the heroes of the war who passionately dreamed of this day with the sun in the school window, smiles on the faces of our children and grandchildren and victories in labor.

By remembering the past, you rejoice at the life around you. Yes, I am a happy person, because in the struggle for that happiness I was always with our party of communists and with our own Soviet power."

These lines were taken from a letter from Yugamash I. Khalikov, a resident of a Bashkir village. The veteran of the front shared his innermost thoughts about the party and the Motherland, of which being an active citizen is really the great happiness of a Soviet person.

Major A. Terekhov from the Siberian Military District, Lieutenant Colonel (Retired) K. Akulov from Orenburg, Private I. Donets from the North Caucasus Military District and many other readers write the editor about pride in the Soviet country and about their filial duty to strengthen its might. Warmly and unanimously approving the decisions of the special February CPSU Central Committee Plenum and the speech of General Secretary of the CPSU Central Committee comrade K. U. Chernenko, servicemen of the Army and Navy are giving all their efforts and the heat of their hearts to increasing combat readiness of the units (chasti) and ships.

"I serve in an outpost of the Far East Military District," writes Lieutenant N. Luk'yanov. "The taiga is boundless all around and even takes your breath away. They say it is a god-forsaken place. I will not believe it. This land



is beautiful and we are proud of the confidence shown us to stand guard over its everyday working life. First there was a many-kilometer march over the rigorous taiga roads. Then firing range practice. We returned to the post with an excellent evaluation and the gratitude of the senior officer."

Letters from many other readers speak of the fact that servicemen are determined to complete the winter training period worthily and to emerge as victors in the socialist competition.

In the mail of the last days of February there were many reader responses to the decisions of the special CPSU Central Committee Plenum. In one of them Major Ya. Krayev reports: "The personnel of the motorized rifle regiment are studying with great interest the speech by General Secretary of the CPSU Central Committee comrade K. U. Chernenko at the plenum. Communists officers B. Gromov, V. Yakovlev, R. Il'ichev, propagandists and agitators are giving lectures, reports and talks in the subunits (podrazdeleniya). Our country's achievements and our party's plans for the future gladden and inspire soldiers for the struggle for further increasing combat readiness."

The Soviet people and members of the Army and Navy are meeting the elections to the Supreme Soviet of the USSR with great labor and political enthusiasm. In reports from localities, readers tell about the work of the polling places and agitation centers these days and about the special attention that has surrounded young soldiers voting for the first time.

Celebrating the nationwide holiday, personnel of units and ships as well as all Soviet people are proud of their beautiful Motherland. "It is a great joy. to be its son," Senior Warrant Officer D. Fialko from the Odessa Military District states in his letter. "In return for everything it has given and is giving us, we render it boundless love and devotion. We think of the party with pride and believe in its mighty collective intelligence and will. It is our support and hope and our thoughts and deeds are with it. By closing our ranks more closely around the Leninist Central Committee, we assure the Fatherland that we will always vigilantly stand guard over the achievements of the Great October."

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## GROUND FORCES

### MOUNTAIN TRAINING EXERCISE DESCRIBED

Moscow KRASNAYA ZVEZDA in Russian 28 Feb 84 p 1

[Captain A. Dergilev: "Cadets Assault The Terek"]

[Text] Captain S. Storozhenko glanced at the luminous hands of his watch. Dawn was still not breaking and the line of attack was already close, but in the mountains minutes are especially valuable. The commander of the cadet company decided to step up the pace, although the tempo of the forced-march was already faster than the planned mountain training program.

The training mission assigned to the cadets of the Ordzhonikidze Senior Combined Arms Command School imeni Marshal of the Soviet Union A.I. Yeremenko was difficult. The "enemy" was dug in on a ravine blocking the main force's advance. It was impossible to overcome its defenses without a flanking movement. The cadet battalion commanded by Colonel A. Belozor was acting as an enveloping force and had to complete a long night march along mountain paths, come out on a pass located at 2200 meters above sea level, cross the Terek and attack an "enemy" strong point. A group of specially trained mountain-climbers which Sports Master Lieutenant Colonel B. Bondarenko was leading along an especially difficult march had to attack the defenders from their rear.

A lot depended on the accuracy of coordination. That is why Captain S. Storozhenko looked at his watch and hurried his subordinates.

The cadets were very near the pass when they found their path blocked by a sheer cliff. Alpine equipment went into action. Listed sportsmen Sergeant A. Bruslavytsev and cadets A. Vakalyuk and A. Shevchneko were first to hit the obstacle. One could rely on any one of them. And yet Captain Storozhenko had several assistants ready to take on the assignment and lead their comrades by example.

After the ascent there was the no less difficult descent. And here the future officers ran into an "enemy" ambush. After using the natural cover they concentrated their fire, fixed and destroyed the "enemy" firing positions. The company commander did a lot of diversionary maneuvering with his combat groups. Captain Storozhenko put a lot of significance on small unit independent action in all exercises. Before serving at the school he had commanded

a motorized rifle company in the limited contingent of Soviet troops in Afghanistan and had been awarded the medal "For Courage." True, he had previous experience in mountain operations. This he had acquired here at the Ordzhonikidze Combined Arms School which he completed 7 years ago.

For more than a year the school had placed a lot of emphasis on mountain training. Each class annually climbs one of the Caucasus peaks and leaves a pendant behind on "its hill," as the cadets say. The graduating class climbs Kazbek. Almost all cadets in the school are awarded the emblem "Alpinist of the USSR" and many complete official sportsman norms. Last year 9 became alpine instructors.

Mountain training means a lot to the graduates. Among them are people who have been awarded medals and orders. And Major R. Aushev and Lieutenant G. Demchenko were honored with the rank of Hero of the Soviet Union.

Having once again looked at his watch, Captail Storozhenko thought with satisfaction that the decision to increase the march pace had been correct as they had needed time to destroy the ambush.

The subunit came out on the Terek at dawn. First to throw themselves into the violent river were Senior Lieutenant A. Suydimov's subordinates. The remaining platoons covered them with fire. To the left and right other companies of the cadet battalion began to cross. And the alpine group commanded by Lieutenant Colonel B. Bondarenko attacked the "enemy" from their rear. This attack surprised the defenders as there were no trails in the area.

The cadets swiftly overcame the cold stream. The current swept them off their feet and tried to carry them to the waterfall, but comrade helped comrade. A squall of fire hit the "enemy" from all sides. Soon the way was opened for the military subunits with whom the cadets were cooperating on this exercise.

Commander of troops for the Red Banner North Caucasus Military District Colonel General V. Meretskov had observed the tactical training and rated the actions of the future officers highly. He expressed his appreciation to the cadets and selected Captain S. Storozhenko's company as the best.

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## AIR/AIR DEFENSE FORCES

### PILOT TRAINING TO INCLUDE UNFAMILIAR AIRPORT LANDINGS

Moscow KRASNAYA ZVEZDA in Russian 13 Mar 84 p 2

[Article by Military Pilot 1st Class Guards Lieutenant Colonel V. Lizun, deputy commander of an air regiment for flight training: "Making a Landing at An Alternate Airfield"]

[Text] It was a duel of speed and skill. The airborne "enemy," sensing that he was being pursued, switched on his afterburner and attempted to escape under the cover of night. But, having an altitude margin, Guards Major Yu. Chapyshev was able to maneuver so that his missile-carrying aircraft crossed the route of the target. He succeeded in doing this at the most distant interception line.

The rest, as the saying goes, was the equipment's business. After the missile launch Guards Major Chapyshev reported on execution of the mission and headed for his airfield. But now a report was received from the ground: along the route he was to follow there were heavy storm clouds which it was necessary to avoid. The officer cast a glance at the instruments. The flow-rate indicator showed a fuel remainder that would not have allowed the flight to reach the airfield in the event that it flew around the cloudiness.

The guards major reported his calculations to the ground. The flying control officer inquired on the spot about the nearest airfield from the interceptor. There they gave an "okay" for the landing. Chapyshev received a new course to follow. With a view to providing flight safety, the fighter aircraft was directed to an alternate airfield.

The darkness hampered his orientation. But, to the pilot's credit, he coped successfully with the difficult task and skillfully landed the aircraft at an airfield which was unfamiliar to him.

It's not on every flight that aviators, owing to the force of one circumstance or another, have to land at a "foreign" airfield. But, nevertheless, it's worth giving this some thought. And here's why. It's not a secret that the appearance of the latest generation of all-weather aircraft, which are equipped with modern radioelectronic equipment, gave rise to, I would say, a superficial opinion of this kind among some aviators: improved electronics are now working on board a combat aircraft, they say, for a human, and they always assist in getting out to the necessary area and landing the aircraft at any airfield.

Of course, the electronics on board are reliable. But it's impossible to forget the fact that however much the electronics were improved, the final word nevertheless rests with a human. In the end, the success of things depends precisely on his skills to utilize the resources of modern winged aircraft as much as possible.

Guards Senior Lieutenant S. Smirnov was faced with landing a fighter at an alternate airfield in the daytime. This was stipulated by the flying mission, so the elements of surprise are out of the question. And, nevertheless, the pilot was approaching the runway on a reciprocal course. It was good that the flying control officer noticed this error in time. Naturally, the missile-carrying aircraft was directed to go around. It was led out to the necessary point. Smirnov made a successful landing only after the second approach.

What was the reason for the pilot's error? Perhaps the equipment let him down? No, the airborne navigational equipment was in good working order. But, it appears, one of the main reasons for the blunder is in the fact that theoretical and practical training for a given mission didn't prove to be at the proper level for the young pilot. And all because of the fact that from time to time the opinion was slipped to him that, they say, if I can make an outstanding landing with the aircraft at my own airfield, then I can also land at any other. But, as we see, his presumption let him down.

Solving problems connected with the pilot's ability to demonstrate fancy flying equipment and good skills when landing at an unfamiliar airfield, it seems, is by no means of minor importance. In the first place, it's impossible to forget about the fact that right now during the days of peacetime combat training, we must persistently learn to win a victory over a powerful enemy. So then, the first duty of a military pilot is to execute in an outstanding manner a simulated combat mission associated with and including landing at a "foreign" airfield. Let's turn to the experience of the Great Patriotic War and look through the pages of recollections of frontline soldiers and aviators. Occasions, when military airmen, having done everything for executing a mission, sought to "stretch" the frontline to our nearest airfield, were far from rare. Must we really not prepare ourselves for this now?

Secondly, in the course of combat training the necessity also can arise suddenly to land a winged aircraft at an alternate airfield. For example, when there's a sharp deterioration of the weather, it does happen that a landing at one's own airfield becomes undesirable. Other difficulties also can arise. Let's say, an aircraft must make an emergency landing for technical reasons and it's still a long way to the departure airfield. It's not by chance, while giving his subordinates preflight instructions, that a regimental commander always reports the necessary data concerning the nearest airfields, although a landing isn't planned at them. In short, all of us, while we're in the air, must at any moment be psychologically prepared for situations when we have to change course and proceed to an alternate airfield.

But any pilot who has gained certain experience in this knows very well that landing a winged aircraft at one's own airfield and at a "foreign" one is by no means one and the same thing. Like a good master in his house, a pilot at his



own airfield knows what is located where. He remembers every one of the reference points. You're always told at what distance they are from the runway. And when you're making a landing visually, and not with instruments, it's possible to determine by the reference points whether your descent path is accurate or not. And on the air are the familiar voices of members of the flight operations control group! After years of joint service they become relatives and they inspire confidence and composure. They don't speak in vain: houses and walls help.

The alternate airfield is another matter. The reference points here are also unfamiliar and at times the instructions of the flying control officer are difficult to make out: it's not the same articulation and not the same timbre of voice. Perhaps it's everything. So the psychological preparation for the precisely regulated actions under such complicated conditions must also be constant, and theoretical and practical studies on these matters should be conducted systematically.

For example, pilot training in our regiment is thought out so that, following the well-known principle of "from the simple to the complex," from month to month we improved our theoretical knowledge and practical skills on operations at unfamiliar airfields.

At first these matters are worked out theoretically in the commander's training system. In addition, we are planning to conduct special drills with the pilots on preparing the equipment for a repeat mission. Here's what this is necessary for. Landing an aircraft at an alternate airfield is only half of the matter. A no less complicated task is returning to the departure airfield. As a matter of fact, a pilot operates under conditions such as these without a combat aircraft technician, a mechanic and other ground specialists. And he himself has to check the readiness of the fighter aircraft for its takeoff into the sky.

For example, how was it with Major Chapyshev in the situation referred to above? At his alternate airfield they filled the aircraft with fuel, compressed gas and special fluids. Chapyshev supervised the refueling of the fighter aircraft and he himself tuned the radionavigational equipment. And his engineering knowledge here came in handy in the best way possible and he performed the fighter aircraft's equipment operations and drills in which he had enthusiastically participated at planning study sessions. All this also predetermined his successful return to his own airfield.

In addition to the drills, we also systematically plan special flights to unknown or unfamiliar airfields and to dispersal points. We also use other means for training.

For example, the squadron led by Guards Lieutenant Colonel V. Kozhevnikov was faced with a cross-country flight to another airfield for performing practice combat gunnery. The aviators made good use of the airfields along the way for practice landings. The cross-country flight to the firing range was accomplished in an organized manner and without criticisms. And, having executed operational launches against airborne targets with a rating of "outstanding," the aviators also performed confidently there at the unfamiliar airfield. This cross-country flight taught us a great deal.

But, nevertheless, I can't say that all our problems associated with instructing pilots to land and work at alternate airfields have been solved. In the current training year we should devote more attention to young pilots who are just beginning to comprehend the special features of operations from "foreign" airfields. I remember what a test of self-control and will the first landing in my life at an unfamiliar airfield was. Coming from personal experience, I think that the nurturing among young aviators of concentration and coolness and their psychological preparation for confident actions in an unfamiliar situation are of paramount importance.

Or take the solving of technical matters, let's say, of those which on the face of it are the simplest, like refueling an aircraft. Not all young pilots can do this without a mistake. There were instances when Guards Senior Lieutenant A. Popov and Guards Lieutenant S. Grebenyuk experienced difficulties in doing this. And as a matter of fact it can happen such that, owing to the force of one circumstance or another, the pilot himself will not just have to refuel his combat aircraft at an alternate airfield. This also pertains to other moments in preparing a missile-carrying aircraft for a repeat mission.

And how important for a pilot, and particularly for a young one, are the sympathy and benevolence of those who receive him at the alternate airfield. Even an unfamiliar but reassuring voice on the air inspires confidence and forces you to think that they're waiting for you there. This helps you to make a landing in a confident manner.

But are they really waiting for us at a "foreign" runway? Unfortunately, no. One day Guards Major V. Klochkov had to land at an alternate airfield because of a sudden deterioration of the weather (a snow shower) at his own airfield. But, as it turned out, the necessary fuel specification wasn't there. And the local commanders and the support services did practically nothing to assist the pilot in returning more quickly to his own airfield.

Instances are frequent when one has to "bake in the sun" for a long time at a "foreign" airfield because of all kinds of delays in supplying special equipment and a fuel truck for the aircraft. One day I had to ferry an aircraft from a plant following preventive maintenance. And what of it? At one airfield I was both met and quickly assisted in preparing the fighter aircraft for departure. And at the other I had to stand for hours waiting on special purpose vehicles. And just to obtain some kind of spare part! You're not one of ours, they say, and we don't have anything to do with your troubles.

On the whole, there are a lot of problems associated with landing at an unfamiliar airfield. And we aviators have to solve them together. Undoubtedly this will only be to the benefit of the matter and in the end have a positive effect on further increasing the combat readiness of aviation units and subunits [podrazdeleniye].

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## AIR/AIR DEFENSE FORCES

### WINGMAN'S CONTRIBUTION TO MISSION SUCCESS DISCUSSED

Moscow KRASNAYA ZVEZDA in Russian 22 Mar 84 p 2

[Article Military Pilot 1st Class Major N. Goryayev of the Group of Soviet Forces in Germany: "The Wingman Attacks"]

[Text] The missile-carrying aircraft which I was piloting was already on the bombing run when all of a sudden the air situation became abruptly complicated. All my attempts to spot the ground target didn't provide the desired result. And the seconds melted away with alarming speed. I had to ask Captain V. Shtokarev at once:

"Are you observing the target?"

"I see it," followed the confident report of the wingman.

He took the position of the leader on an arranged signal. The bombing was executed according to his data and as a result of which both our crews destroyed the target on the first run.

Usually, when aviators are faced with inflicting a strike against the "enemy," the entire responsibility for the successful and safe execution of the group's flight is placed on the lead pilot. It's precisely he who is assigned to continuously run the group from the start of taxiing out to the landing of the aircraft, to supervise the actions of the wingmen in the process of performing the missions which have been set, to personally observe and evaluate the air and weather situation, to make the necessary decisions, and to use all resources for their timely and competent execution.

In cases such as these the wingman becomes the executor of the lead pilot's plans. He is obliged to constantly maintain his place in the formation, to continuously follow the leader and not to lose sight of him, and to attentively listen to all of his commands and execute them in an accurate manner.

Such a situation is regulated by many years of practice and is secured in documents which regulate the combat application of modern aviation systems. But experience attests to the fact that today the role of the wingman frequently exceeds the limits of simply imitating the leader's actions. Under conditions

when the methods of aerial attacks have undergone noticeable changes because of the considerable missile launch ranges, expanded orders of battle and the large volumes of space essential for maneuvering supersonic aircraft, the ability of each pilot to perform skillfully in an independent manner and his willingness at any moment to take upon himself full responsibility for successfully solving the over-all mission comes to the forefront.

What helped the flight element in which I was the leader to perform the bombing under complicated conditions with high results? First of all, it was the fact that the wingman was fully prepared to perform independently and with initiative in the situation when the procedure which had been worked out for executing the flying mission was disturbed. The experienced aviator didn't waste a single minute meditating on what he needed to undertake, but immediately performed all operations essential for successfully completing the simulated combat attack.

The practice of tactical flying exercises showed that situations such as this are far from a rarity. Comparatively recently at the bombing range, during the concluding phase of the flight Captain M. Pidluzhnyak in accordance with the tactical problem "lost" visual contact with the leader. The pilot received a command to independently conduct a search for the ground target and to make a bomb strike against it. He skillfully selected the optimum direction for the attack approach with regard to the possible arrangement of the "enemy's" PVO [air defense] facilities, and he accurately calculated the position of the release point for the aerial bombs relative to the target of the strike.

The situation in actual combat can be still more complex when the enemy seeks through any means to destroy first of all the element or the group leader. And if the wingman turns out to be unable to independently make the correct decision, the mission which was set may be unfulfilled. The conversation has turned to this subject more than once in our squadron. At first somebody demonstrated that without the support of the leader and without his commands and instructions the wingman risks finding himself in a complicated situation, when he has neither the sufficient training nor the knowledge for successfully continuing the combat training mission.

In this case, the supporters of a strong connection within the element turned to the experience of the last war when the formula "the leader attacks and the wingman covers" was legitimized. A combat procedure precisely such as this also helped our pilots in difficult air battles to gain the victory over a strong and experienced enemy. It was also precisely the element that became the basic firing and tactical unit and which was used for reconnaissance flights, covering ground forces and actions for supporting the combat operations of other kinds and arms of aviation.

The very practice of combat operations during the years of the Great Patriotic War led to this formula, when the leader firmly expected that the wingman will always cover him from an enemy attack from behind--the effective firing range was less than the distance of visual acquisition of the attacking enemy by the wingman. In addition, aircraft design and short distances and intervals in the combat formations of an element allowed the leader to visually direct the wingman's actions, to monitor his position and to synchronize his maneuvers with the second pilot's possibilities.

Aviation systems which have appeared in recent years have armament which in its power exceeds many times over the aircraft armament of the period of the Great Patriotic War and on-board acquisition equipment provides the opportunity to see targets at ranges dozens of times greater than the range of visual acquisition. In addition, improved navigational equipment allows the modern missile-carrying aircraft to perform flights under practically any weather conditions day and night, and then to independently make a landing at any airfield. In short, right now a missile-carrying aircraft is in a position alone to destroy any airborne or ground target with high probability.

All of this, undoubtedly, can't help but affect today's role of the leader. He's not able with the former categoricalness to direct the actions of the wingman, since he frequently pictures his position in just a speculative manner. The wingman, who because of the great distances and intervals in the element is forced more often to divert his attention to maintaining his place in the formation, is also at a disadvantage now and then. This in turn leads to being late in executing a maneuver and then to reducing the element's tactical advantage.

I'd like to note that both the careful reading of special literature and the practice of tactical flight exercises, in which I had the occasion to participate, brought me to such reflections. I also formed an opinion on this basis that, to my mind, the training of a leader and a wingman, and to such an extent that would promote in every way possible the development of independence for each of them and faith in their own strengths, initiatives, boldness in combat and resourcefulness, demands greater attention.

Somehow in a tactical flying exercise one of the pilots who had deviated from the assigned course temporarily lost visual contact with his leader. The pilot began to worry and nervousness began to appear in his actions. The flight control officer had to use all of his experience and skill so that the wingman could execute the assigned mission.

This incident served as a topic of serious conversation among the squadron's aviators. Captain S. Bunin, one of the subunit's [podrazdeleniye] more trained pilots, came to the aid of his colleague. He willingly shared his experience with his comrade and related to him in detail the special features of executing the more complex training missions. It turned out that the pilot didn't always take notice of the increase in distance between him and the leader when executing a turn. This occurred because he involuntarily decreased the bank of the aircraft during a turn. Additional studies and training periods helped the pilot rid himself of the error.

In my opinion, the solution of various kinds of tactical problems trains one best of all to search for independent answers and to have the ability to correctly, and in the most compressed time frames, select from the stream of information which is received that which is more valuable and essential during a given moment of simulated combat. The debriefing of particular events of the flight is especially important to me here when the question concerns complex situations in which the wingman can find himself for one reason or another.

In a situation when execution of the mission turns out to be under the threat of failure and while not awaiting promptings from the leader, the wingman is required to have positive concentration, self-control and the ability to make the correct decision during the calculated moments. But for this it's essential that while still on the ground he imagines possible deviations from the assigned flight routine as thoroughly as possible. That's why in my squadron we are endeavoring to sort out in detail all possible situations which can occur in the air. We're directing pilot training for actions in particular flight occurrences towards that so that aviators may lastingly recall the established procedure for executing operations in one complex situation or another and that they may cultivate a combination of honed skills until they become automatic. Each pilot has special diagrams where the procedure is indicated for the complication of a situation in a certain, precisely designed logical and provisional sequence. This develops the ability among the aviators to foresee the development of events, increases their confidence in successful execution of the mission and trains them to think that without the assistance and support of the leader it's possible to cope with all surprises.

In my opinion, it's very important to conduct flight debriefings in a psychologically correct manner for nurturing independence among pilot leaders. I know myself that if at a debriefing special stress is put just on overemphasizing mistakes and shortcomings, then the pilot has a feeling of annoyance and bewilderment which prevents him from impartially evaluating remarks which even in general are precisely true and correct. In situations such as this it automatically seems that the instructor treats you in a biased manner and tries to emphasize his superiority.

On the other hand, how much satisfaction a businesslike and thorough flight analysis brings when the conversation is conducted in a quiet, benevolent tone of voice and with a sincere desire to help one's colleague! The way Captain V. Sysoyev conducts a debriefing of his wingmen's actions always causes me joy. He tries together with the trainee to get to the point of those occurrences which in the course of executing the flight mission led to an error or could cause serious complications. In this case, I wouldn't say that the flight commander is trying to smooth things over. In cases like these, Captain V. Sysoyev talks about the shortcomings in an open and frank manner, but this never causes a painful feeling of resentment among the pilots because he carefully weighs each of his words and every one of his arguments. After debriefings like these the pilots present their strong and weak points more clearly, and then they see more specifically the ways and means for improving their combat skill.

The mighty missile-carrying aircraft ascend into the sky with a heavy rumble. The responsibility for successfully executing the assigned mission rests first of all on the leader. But if it's required, the wingman is ready to independently make a strike against the "enemy" and to achieve victory in combat.

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## AIR/AIR DEFENSE FORCES

### ROLE OF FLIGHT EQUIPMENT SPECIALIST DISCUSSED

Moscow KRASNAYA ZVEZDA in Russian 24 Mar 84 p 1

[Article by Lieutenant Colonel L. Isakov of the Southern Group of Forces:  
"Impartial Controllers--The Main Thing is Efficiency and Quality"]

[Text] While aviators of the flight commanded by Military Pilot 1st Class Guards Captain A. Shibayev were preparing for a second mission, specialists of the target monitoring group led by Guards Senior Lieutenant of the Technical Service S. Karpov were operationally processing the films of the monitoring and recording equipment and preparing them for analysis. And this is what they reported on the loudspeaker communications from the engineer's monitoring station:

"Aircraft number....film is standard."

This means that all systems, units and assemblies on the aircraft are operating safely. Consequently, the aircraft can be launched again into the air.

The specialists of the target monitoring group always begin to prepare for flights in good time. For at least a day before them Karpov receives a copy of the planning chart and studies it carefully. The group chief determines the saturation of the flight shift and gives his subordinates instructions for preparing the necessary quantity of loaded recording cassettes.

Such purposeful preparation, which is multiplied by experience and a profound knowledge of one's business, makes it possible for the soldiers of the target monitoring group in the course of the flight shift to rapidly process and analyze the data from the on-board target monitoring equipment. And this is very important: the film of the automated flight recorder system (SARPP) is an impartial document and one which attests to the quality of servicing the aircraft and to the pilot's work in the air.

Each time before ascending into the sky, the air warriors drop by the room of the target monitoring group. Military Pilot 1st Class Guards Senior Lieutenant Chayko dropped by here too. He made the necessary notes in the interflight control register. These entries are very essential to target monitoring group specialists since the pilot marked in the register the names of all the flight configurations and maneuvers which he was faced with mastering in the air,

and he recorded the calculated flight parameters at the check points: minimum and maximum altitude, speed, g-forces and angles of attack.

After the pilot performs the exercise, the chief of the target monitoring group compares all parameters of the actual flight with those which were stipulated by the exercise. And if discrepancies are revealed, then the flight commander to whom the pilot is subordinate analyzes what caused the deviations. And the reasons can be most diverse. Either the pilot acted out of incompetence or he was obliged to deviate from the conditions of performing the exercise in accordance with a command from the ground and so forth.

The flight shift was approaching the end. As the regimental commander emphasized at the debriefing, the aviators mastered all tasks with high quality. The socialist commitments which were undertaken by the flight shift were completely fulfilled. The people of an insignificant, at first glance, specialty--the soldiers of the target monitoring group--made a considerable contribution to this.

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## NAVAL FORCES

### OUTSTANDING SUBMARINE COMMANDER PROFILED

Moscow KRSNAYA ZVEZDA in Russian 28 Feb 84 p 1

[Captain 2nd Rank A. Zlydnev, Red Banner Pacific Ocean Fleet: "Master of the Torpedo Attack"]

[Text] With each mile of the submarine's cruise the danger that it might be detected grew. "Enemy" ships were maneuvering frantically in this region. And the submarine commanded by Captain 2nd Rank A. Marfutin had the difficult mission of silently trailing them, maintaining a fire control solution on each of them and being ready at a moment's notice to begin a torpedo run.

The main advantage of a submarine is secrecy. Marfutin didn't forget this for a minute. And he knew another thing perfectly well--fatigue built up in personnel during the many weeks of an ocean cruise. This is a natural phenomenon. Therefore, while taking reports from compartments, the commander listened attentively to the voices of his subordinates to see if anyone was weakening.

This is one of Marfutin's rules. If you can't check visually, listen to the voice to determine a sailor's spiritual condition. In the two and one half years that he has commanded the ship the officer has not made a mistake. The commander of the electro-navigational group, Lieutenant I. Prutkov, for example, can confirm this.

He was working listlessly and sluggishly during one of his watches and as a result he allowed an error in calculating a simple maneuver. The navigator made a rather sharp comment to the lieutenant and immediately corrected the error. The lieutenant totally drooped after this and withdrew into his shell. The commander, despite his own busy schedule, was able to keenly pick up on this. He found a "window" in his own full cruise routine and invited the lieutenant to his cabin. The captain talked to him sternly but at the same time benevolently and told him specifically how he had in his own lieutenancy overcome difficulties in developing. The captain then gave him a number of specific recommendations. Prutkov left the cabin in a totally different mood, wanting to work better.

Such episodes are not rare in the indoctrinational work of Communist Marfutin. While he was still a senior submarine captain's assistant he in many ways

helped Captain 3rd Rank A. Mikhov become confident and stand on his own two feet. Now this same Mikhov, himself a senior commander's assistant equaling Marfutin, is able to teach subordinates and mobilize them to overcome any difficulties.

In many ways thanks to Marfutin, a reliable backbone of officers has been developed on the ship. And the whole crew is noted for its solidarity and reliability. This is a source of the military successes of the submariners. This year this outstanding crew is one of the best crews in the navy.

The submarine's sonar is tenaciously maintaining contact with the main target of the "enemy" convoy. The defensive sonar of these ships cannot detect the submarine. Marfutin puts his ship into a conditional torpedo attack a third time and again he is successful. The submariners pass the regular inspection in the deep with honor.

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## FOREIGN MILITARY AFFAIRS

### DEVELOPMENT OF MILITARY SATELLITE COMMUNICATIONS SYSTEMS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 12-16

[Article by Engr-Col A. Zhovanik, candidate of technical sciences; passages rendered in all capital letters printed in boldface in source]

[Text] In building up aggressive preparations, the U.S. military-political leadership is constantly improving military communications systems and equipment in addition to developing new kinds of weapons and preparing the armed forces for conducting combat actions in various parts of the globe. In the opinion of the U.S. leadership, these communications systems must provide for greater speed and security in transmitting information, high anti-interference capability, reliability of channel functioning, efficiency and flexibility in establishing communications, and transportability and mobility of ground stations. A system's capability to secure and encode information and get it to subscribers with great validity and reliability, and the protection of radio lines against deliberate enemy jamming are considered to be important conditions. In the opinion of foreign specialists, satellite communications systems meet these requirements most fully.

Initially, leased channels of commercial satellite communications system were used for command and control in the United States, but the Pentagon concluded that such channels are very vulnerable and may be knocked out during military actions. It was therefore decided to develop the first generation of military communications satellites and the DSCS [Defense Satellite Communications System]. The U.S. Armed Forces command motivated the need for using special satellites for setting up military communications primarily because of such specific requirements as the survivability of space facilities and the ECCM [electronic countercountermeasures] of communications under conditions of an armed conflict.

Specialists proposed to solve the problem of improving survivability of first generation military satellites by increasing their total number in orbit and by maximum simplification and cost reduction of the spacecraft design. There was one intent: to make the task of destroying such a craft in orbit extremely unprofitable from an economic point of view, i.e., much more expensive than the immediate cost of the satellite itself.

Developers decided to protect the DSCS-1 satellite in orbit against deliberate jamming by applying anti-interference methods of modulation and encoding of information on satellite radio lines and by eliminating the control of satellites during operation. To avoid the need for controlling satellites by commands from the earth, all their on-board devices were turned on for the entire operating period after being placed in orbit.

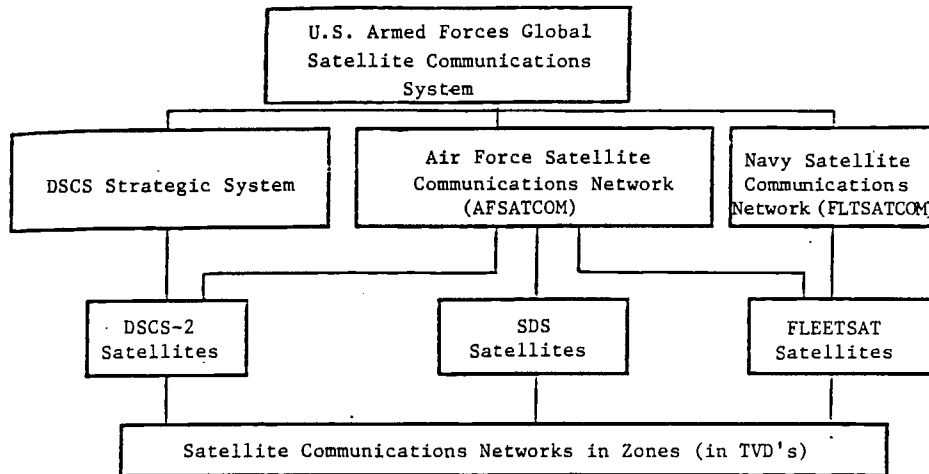


Fig. 1. Structure of U.S. Armed Forces global satellite communications system

But according to western press reports, despite the fact that there was success in achieving the requisite survivability of spacecraft and the jamming resistance of communications, the operation of satellites and ground stations was characterized on the whole by extremely poor efficiency. After a certain time, satellites placed in orbit and distributed evenly above the Equator in the initial period would converge and begin to create mutual interference with each other and with the stations working through them. In the process of testing the first models American specialists concluded that to employ spaceborne means more effectively they must be developed as a single system of satellite communications with centralized control over all its elements. With this in mind the United States sanctioned the development of a far-flung system of satellite communications for the Armed Forces (Fig. 1), which allows establishing communications and assuring high-quality exchange of information with fixed and mobile subscribers, carrying on telephone conversations with them, transmitting various data, and exchanging documents using phototelegraph and facsimile equipment. The quality of communications practically does not depend on time of year or day, natural interference, or atmospheric ionization.

Development of the ISZ [artificial earth satellites] and ground stations requires extensive physical inputs and a high level of development of electronics and space technology. For this reason satellite communications is considered most effective in arranging for the exchange of information over long distances. Despite its positive qualities, however, modern

communications using the ISZ has insufficient survivability and jamming resistance and so cannot fully replace the other means of communications. This is why it is viewed as an important component of the overall communications network which supports army and navy command and control.

The field of application of satellite communications assets for military purposes is quite vast. In particular, the Pentagon makes extensive use of them for command and control of troops or forces stationed in remote TVD's [theaters of military operations], for exchanging data in automated control systems and over various communications networks, and in accomplishing many other operational missions. The western press reported that in 1980 the U.S. Defense Department transmitted 70 percent of all information intended for troops stationed in overseas territories via communications satellites.

The United States has set up three global military satellite communications systems (networks) (DSCS-2, FLTSATCOM, AFSATCOM) and two commercial systems (Marisat and Intelsat), in which a portion of the channels is used for U.S. Armed Forces interests in peacetime.

THE DSCS-2 STRATEGIC DEPARTMENT OF DEFENSE SATELLITE COMMUNICATIONS SYSTEM began to be tested in 1973. It was intended for exchanging information between the country's highest leadership and the headquarters and establishments of U.S. Armed Forces, and for providing diplomatic communications with embassies outside the American continent. Centimeter waves (the frequency range of 7250-7750 and 7900-8400 MHz) and communications channels with a considerable capacity are used for this system's operation.

A total of 17 second generation satellites were made, of which 11 were successfully placed in a geostationary orbit: seven (four operating and three reserve) presently provide the most important communications using more than 130 ground stations located in various parts of the globe, two already have exhausted the guaranteed orbital life, and two were not used at all for practical purposes due to design defects. It has been reported that various difficulties were encountered in developing this system which led to an overexpenditure of physical inputs and a considerable delay in time periods. As a result the technical solutions developed in the late 1960's for second generation satellites became obsolete even before their practical adoption on the operating communications lines.

Development of the following generation of satellites (DSCS-3) for modernizing this system was begun in 1975 with consideration of this. The first experimental model placed in a given orbit in October 1982 (with a more than two-year delay) provides for testing. When the system is fully deployed using new satellites (DSCS-3) it is to consist of around 400 stations, the operation of which will be supported by six satellites (four operating and two reserve) in a geostationary orbit. Reserve satellites, which are intended for assuring the system's continuous functioning in case an ISZ malfunctions, will be located at points of the geostationary orbit over zones of the most intensive communications.

In the developers' opinion, DSCS-3 satellites will have a greater active longevity, increased capacity, receivers which are less vulnerable to the effects of deliberate jamming, and they will permit more flexible control of on-board systems. This satellite was developed to provide communications at the strategic and tactical control levels of the U.S. Armed Forces. Almost all existing satellite communications stations of the United States and NATO will be able to operate via its on-board repeaters. The work mode of mobile tactical communications stations through the ISZ is considered ineffective, however, and is provided only in case tactical communications satellites are disabled or cease to exist for other reasons.

It was believed during the initial work that full deployment of the DSCS-2 system will meet all needs for communications of the Air Force, Navy and Army, but deficiencies which came to light during testing of the first satellite and the significant delays in making the system operational required the development of additional FLTSATCOM and AFSATCOM satellite communications networks.

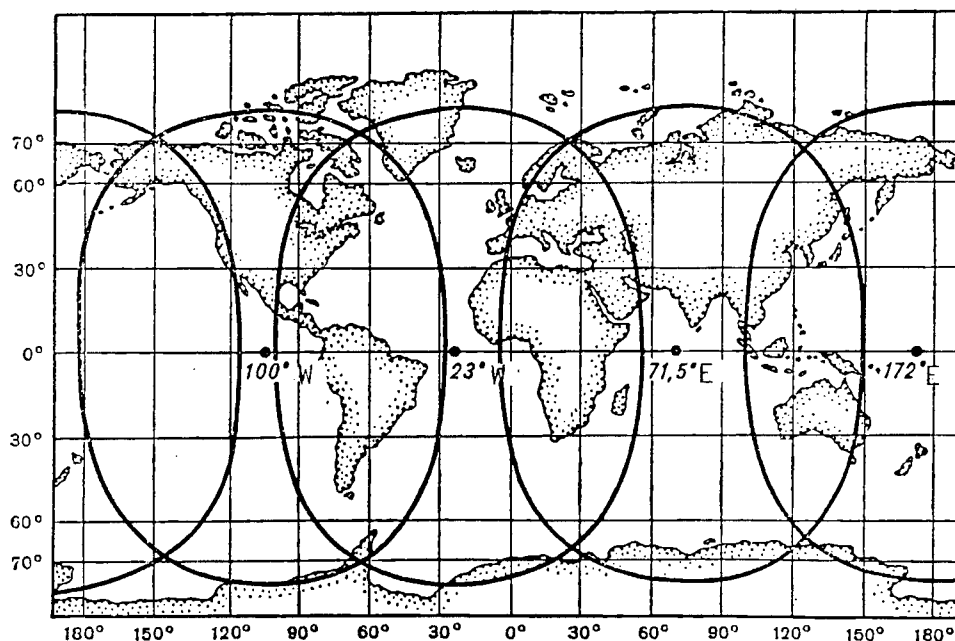


Fig. 2. FLTSATCOM satellite coverage

THE FLTSATCOM SATELLITE COMMUNICATIONS NETWORK has been in operation since 1978. It is intended for supporting command and control of U.S. naval forces. A total of five FLTSATCOM satellites were manufactured, four of which are being used without limitation for ultra long-range and intercontinental communications (Fig. 2), and one was damaged during launch and is inoperative in orbit. Within this network warning signals are transmitted to all ships and information is exchanged with a significant number of ships of the basic classes (more than 500 transceiver stations) via one satellite. To reduce the system cost steps were taken to simplify the design of shipboard stations being newly developed.

The decimeter wave band was chosen as the primary band for the FLTSATCOM satellite communications network. Information is transmitted at frequencies of 225-400 MHz. Consideration was given to the fact that equipment in this band is simple to manufacture and sufficiently mastered by industry and that the antennas can be simple devices which can be installed on aircraft, ships, submarines and other mobile naval facilities without particular difficulty.

Foreign specialists believe that the use of decimeter waves not only permitted a station cost reduction, but also a reduction in the time periods for their development, for setting up series production and for being adopted by the Navy. The specialists include among the deficiencies inherent to these stations their limited capacity (as a rule they provide communications over one channel) and a certain susceptibility to the effect of ionospheric disturbances (a brief deterioration in communications quality while in areas near the geomagnetic Equator and in polar areas).

To improve the quality of communications with a large number of stations varying in technical characteristics (shore, shipboard, airborne, portable) operating with each other, American specialists had to install aboard the satellite transceivers which varied in their parameters, antennas with enhanced efficiency, two on-board EVM's [electronic computers] and certain other equipment (power units with greater output and a high-quality system for stabilization and orientation of the spacecraft on three axes), and they had to apply a modular principle of designing on-board equipment.

The foreign press reports that primarily new technical solutions were used in developing the FLTSATCOM spacecraft and so difficulties arose in their practical implementation. It took some two years to make the test model of the satellite and almost four years went for design modifications. FLTSATCOM satellites presently are being improved to include millimeter waveband repeaters in their on-board gear. In addition, development of a simpler satellite--the LEASAT--is under way, with the first launch and inclusion in the naval communications system planned for 1984.

Despite the fact that the FLTSATCOM ISZ was developed under a naval order and a large portion of its channels was allocated to this department, it is the American command's opinion that it can be used effectively for providing communications in ground forces and the Air Force. Western specialists believe, however, that the DSCS and FLTSATCOM satellites are incapable of performing missions during a nuclear conflict since their operating effectiveness may be degraded substantially from the effects of deliberate jamming and false commands on the on-board gear.

The AFSATCOM SATELLITE COMMUNICATIONS NETWORK (made operational in 1979) is intended for communications with Air Force headquarters and units [soyedineniye and chast'] and with nuclear attack assets (ICBM's and strategic bombers) during a global armed conflict. A large number of military satellites in various orbits as well as stations installed in mobile facilities are used for setting up communications in the network. Use of ISZ's located in geostationary and highly elliptic orbits increases communications reliability

during combat actions and permits global communications with mobile facilities, including those in polar areas.

This network includes 12-channel repeaters installed aboard the FLEETSAT ISZ and the SDS satellites, as well as mobile stations operating through them and set up at locations of Air Force higher headquarters (Fig. 3 [figure not reproduced]), aboard airborne command posts, and in subunits of nuclear weapon platforms. All subscribers included in AFSATCOM are provided with 100 words per minute teletype communications in the decimeter waveband. Although this data transmission rate is considered to be rather low, it is the opinion of the Air Force leadership that it is suitable for this network since radio traffic between subscribers chiefly involves the use of brief formatted reports.

According to Air Force plans the AFSATCOM space communications network is being improved by including in it special satellites located in higher orbits to take in more of the earth's surface and to reduce vulnerability. In addition, to prevent the destruction of high-altitude satellites it is planned to declare them sovereign space objects, and an attack on them will be considered an act of aggression. It is planned to use such satellites to set up a network of radio-relay communications in space, which will allow a substantial improvement in survivability of the AFSATCOM communications network and its jamming resistance and capacity.

The Pentagon is spending enormous amounts of money on the development and extension of military satellite communications systems (networks). All branches of the Armed Forces and interested departments lately have been examining the question of a further improvement in the structure of the U.S. Armed Forces joint satellite communications system. In the developers' opinion, this structure will meet the needs of all units and subunits. Its nucleus is to be the MILSTAR ISZ with enhanced survivability, jamming resistance and capacity.

It is planned to take in the majority of control points and other facilities of the armed forces with satellite communications. The Army, Air Force and Navy will use various stations, including fixed and mobile (airborne, shipboard), transportable (pod, sectional), and manpack.

Fixed stations will continue to have antennas of large diameter and to emit considerable power, and transportable stations are designed for movement to their destination by any kind of transportation. It will take no more than two days to set them up and prepare them for operation. According to foreign press data, shipboard stations provide stable communications with a sea state up to 5. The most advanced satellite communications stations will perform advance (preliminary) tuning on 20 frequencies and will provide telephone and telegraph communications and data transmission simultaneously. It is also planned to activate them for line of sight communications without the use of ISZ's. The modular design and built-in monitoring system permit the operator to locate trouble quickly and remedy it by replacing the bad module in no more than ten minutes.



As the foreign press reports, the U.S. Department of the Army approved a program for adopting a new type of satellite communications station intended for the corps-division link. They are designed to operate in the decimeter band through the FLEETSAT ISZ and in the centimeter band through the DSCS-3. The stations are installed on the chassis of a 1.5-ton vehicle to serve corps, division and brigade headquarters. It is emphasized that their set-up time in a new area by a crew of four will not exceed 20 minutes. The corps headquarters station is designed to operate on four links simultaneously (with 24 channels of scrambled communications on each). Decimeter band manpack stations (each weighing around 12 kg) have been manufactured and adopted for subscribers at the lower control levels.

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## FOREIGN MILITARY AFFAIRS

### AIR DEFENSE OF U.S. ARMY UNITS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 33-38

[Article by Lt Col V. Lakhvin; passages rendered in all capital letters printed in boldface in source]

[Text] In pursuit of aggressive goals, the U.S. military-political leadership has unfolded a widescale arms race, spending hundreds of billions of dollars for outfitting the troops with modern weapons and perfecting the organizational structure of units [soyedineniye and chast'] and subunits to improve their strike power and firepower, maneuverability, and protection on the battlefield. These plans place considerable emphasis on combat support and logistical support to combat actions, as well as on developing a reliable air defense, without which, as foreign specialists believe, it is impossible to count on success in combat under present-day conditions.

In the views of the U.S. Army command, air defense of ground troops provides for taking steps to protect troops and logistical facilities against damage from the fire of enemy army aviation helicopters and strikes by enemy tactical aircraft primarily operating at low altitude.

As the foreign military press notes, air defense in a TVD [theater of military operations] is organized centrally, with the Air Force commander in chief in the given theater responsible for it. He establishes the procedure and methods for destroying airborne targets by all means at his disposal. Air defense in the army corps is provided by organic air defense weapons of the combined-arms units [soyedineniye] included in the corps. The corps usually is given the attachment of an air defense brigade for the period of combat actions, with the brigade's subunits used for screening corps-level facilities and for reinforcing the divisions, particularly those operating on the axis of main attack. The brigade usually includes 3-6 battalions of air defense weapons, including 2-4 battalions of Improved Hawk surface-to-air missile [SAM] systems and 1-2 Chaparral-Vulcan battalions. The corps commander is responsible for organizing corps air defense, and the brigade commander (he is the chief of corps air defense) and commanders of organic and attached air defense battalions and the air defense section of the corps combat operations control center (TsUBD) take a direct part in working out specific measures. Certain

facilities in the corps rear may be screened by a Nike-Hercules battalion. As American specialists emphasize, this organization of air defense in the army corps permits an effective fight against the airborne enemy at all altitudes.

Unit air defense is planned on the basis of the army corps commander's decision, which indicates his zone of responsibility, attached air defense forces and weapons, and procedures for control, coordination and logistical support. The division commander exercises overall direction over its organization through the air defense chief (who is the commander of the Chaparral-Vulcan air defense battalion); the latter, together with commanders of the attached subunits, draws up recommendations for use of available air defense weapons based on the tactical plan. The foreign press notes that a division on the axis of main attack may be reinforced by an Improved Hawk battalion from the air defense brigade.

According to the assessment of western specialists, the Improved Hawk battalion attached to a unit is intended for screening troops and facilities against attack by enemy air attack weapons primarily from medium altitudes (a maximum intercept range of 40 km, maximum intercept altitude of 18 km and minimum altitude of 0.03 km). The U.S. Army command believes that it is advisable to employ a battalion equipped with self-propelled SAM systems to provide reliable air defense of first echelon units and subunits. The battalion includes five batteries: headquarters battery, three weapon batteries (each consisting of three weapon platoons of three launchers and a service platoon each), and a logistical battery. The battalion has a total of some 600 persons, 27 launchers, 24 radars of various types and almost 130 vehicles.

As the foreign military press reports, the Improved Hawk battalion is deployed into combat formation (a command post and weapon batteries) for conducting combat actions in accordance with the division commander's concept, the assigned mission, the nature of actions by screened troops, possible directions of the appearance of enemy aircraft and so on. It is emphasized that in arranging to screen a unit operating in the army corps first echelon, the battery firing positions must be far enough away to preclude their destruction by enemy artillery (15 km or more from the line of contact). It is recommended that a mutual overlap of fire be set up to preclude the overflight of enemy aircraft at boundaries of the systems' killing zones. To assure this, the distance between batteries must not exceed 20 km.

The Chaparral-Vulcan air defense battalion, which is an organic subunit of the infantry, mechanized and armored divisions, is intended to combat enemy airborne targets at low altitudes. It has one headquarters battery (five sections and one radar platoon), two Chaparral SAM batteries (12 launchers each, a range of engagement of enemy targets up to 6 km, and an altitude of engagement up to 3 km), and two Vulcan ZSU [self-propelled air defense mount] batteries (12 mounts each, firing can be conducted in single rounds, short or long bursts at distances up to 2 km). The airborne and air assault divisions each include a four-battery Vulcan battalion with a total of 48 mounts. Like the Vulcan ZSU, the Chaparral SAM battery consists of three platoons of four launchers each and three sections (communications, repair and ammunition, and repair of transport facilities). The battalion has around 600 persons, 24

Chaparral launchers, 24 Vulcan ZSU's, eight search radars, approximately 100 radios and more than 100 vehicles.

In the opinion of American military specialists, this battalion organization permits reliable screening of the troops against actions by low-flying enemy helicopters and aircraft. In addition, using the battalion's maneuver capabilities, the division commander can concentrate efforts during combat on screening individual important facilities and move it at full strength or by battery in compressed periods of time to probable sectors of the enemy's concentration of main efforts in order to engage airborne targets from the most dangerous directions. It is believed that tactical employment of the Chaparral-Vulcan air defense battalion will depend on the nature of operations by the division and enemy aircraft.

The foreign military press emphasizes that the Chaparral SAM launchers and Vulcan ZSU's can be used independently for detecting and destroying airborne targets, using for this purpose the guidance and fire control devices which are a part of these systems. Nevertheless it is recommended that they be employed at platoon or battery strength since in this case, in the specialists' opinion, greatest effectiveness is achieved in destroying airborne targets, control is improved, and there is a higher reliability in screening division subunits and units.

American experts believe that the air defense battalion's combat formation must be aligned to assure maximum screening of the troops from likely directions of the air enemy's appearance and to assure mutual support by each other's fire. To this end it is recommended that the Chaparral SAM firing positions be located at a distance of 3-5 km from each other, and those of the Vulcan ZSU up to 1 km from each other.

Portable Redeye SAM systems organized in sections of 3-6 fire teams are present in the ground troops in combat and reconnaissance battalions as well as the field artillery battalions of divisions for immediate screening of troops against air attack from extremely low altitude. The infantry division has 68 air defense weapons, the mechanized division 67, the armored division 72, the airborne division 64 and the air assault division 62. The foreign press indicates that Redeye SAM teams located directly in subunit combat formations search for and destroy low-flying enemy targets. As a rule one or two teams may screen a company, battery or other subunit. In some cases they receive air situation data through their immediate commanders from the Chaparral-Vulcan air defense battalion command post. On the whole, however, as the press notes, they are used under the plans of the commanders of appropriate battalions, which are coordinated with the overall division air defense plan.

Certain recommendations which in the opinion of American military specialists should be adhered to in organizing large-unit air defense in basic kinds of combat are examined below. It is believed that air defense must be conducted with consideration of the assigned missions, its place in the army corps combat formation, the presence of organic and attached air defense forces and weapons, the possible nature of upcoming enemy actions and so on.

As the foreign military press reports, the primary missions of large-unit air defense in the OFFENSIVE are to screen advancing units and subunits, command posts, the division combat operations control center, communications centers, and so on against the air enemy's pressure and to inflict maximum losses on him. Based on this, the Army command deems it advisable to employ the Improved Hawk SAM battalion to destroy airborne targets at the farthest approaches to combat formations of the attacking troops. When the battalion deploys it is recommended that the survivability of its missile systems be enhanced by locating them outside the impact zone of enemy mortar and field artillery fire.

Battery positions must be selected to provide for minimal influence of terrain relief on the systems' killing zones. In some instances dictated by the situation, one or two weapon sections may take up individual positions 10-15 km from the battery's location. In the opinion of western specialists, this increases battery survivability as well as the disposition of air defense weapons in depth. Such a combat formation permits one subunit to remain in place and fire while the others move on the battlefield. One of the deficiencies in employing weapon sections of the Improved Hawk SAM battalion in isolation from the main subunits is considered to be fire control without use of a line for automated transmission of data on the air enemy.

In organizing large-unit air defense with the organic Chaparral-Vulcan air defense battalion, American military specialists recommend consideration of the fact that the smallest subunit which can be assigned a mission of screening subunit combat formations is the Chaparral SAM platoon or Vulcan ZSU platoon. As a rule it is planned to employ the battalion at full strength and in some cases by battery, such as for reinforcing the cover of individual troop groupings or facilities.

The foreign military press has reported that formation of composite weapon batteries is possible to enhance the effectiveness and stability of air defense. To this end it is advisable to set up the Vulcan ZSU positions at a distance of 1,400-1,800 m from the screened facility, and the Chaparral SAM launcher positions 2,000-2,500 m away. In the specialists' opinion, this placement of air defense weapons will permit the best conditions for firing the Vulcan ZSU and will allow destruction of targets by the Chaparral SAM system on distant approaches to the screened facility. To provide cover of maneuverable subunits from the air it is best to employ the Vulcan ZSU, which has a short time of preparation for firing and is capable of firing while moving.

A battalion's combat actions are arranged on the basis of the large-unit commander's decision and the army corps air defense plan. The battalion's commander, being the large-unit air defense chief, develops specific measures to organize air defense and then controls the fire of organic air defense weapons and attached weapons from a command post [CP]. The foreign press notes that proper choice of a CP is of great importance for effective control. Consideration must be given in deploying the CP to convenience of controlling all weapons at the battalion commander's disposal.

During combat, where the situation can change abruptly, American specialists recommend that the air defense battalion commander focus efforts on screening troops on the most important axes of advance to prevent effective pressure from enemy helicopters and aircraft. Screened troops or facilities must not be left without reliable protection from air attack when the air defense subunits move to new firing positions. On the whole, however, in the opinion of American military specialists, the Chaparral-Vulcan air defense battalion can be employed as follows.

One Chaparral SAM battery and two Vulcan ZSU batteries can be attached to first echelon brigades. In this case the Vulcan batteries will screen first echelon subunits and the Chaparral SAM battery will provide air defense for second echelons and the brigade CP against air attacks. It is deemed advisable to employ the remaining Chaparral SAM battery to screen the division TsUBD and the attached Improved Hawk battalion to screen second echelon brigades.

Vulcan self-propelled air defense mounts assigned to cover first echelon subunits usually accomplish air defense missions at platoon strength. When firing positions are chosen for them consideration is given to the need to provide mutual cover, and in this regard the interval between adjacent mounts must not exceed 1,000 m. While screening advancing subunits the ZSU subunits move by leapfrogging in such a manner that the troops are within the air defense subunit's killing zone. In this case the subunit must be constantly ready to have a portion of its forces fire against the air enemy.

In the American command's assessment, this distribution of Chaparral-Vulcan air defense battalion forces and weapons facilitates reliable troop protection against enemy air strikes and maintenance of the necessary rate of advance.

A role of no small importance in the overall large-unit air defense system also is given to most effective employment of the portable Redeye SAM systems. The foreign press notes that their teams operate in strict accordance with plans of the commanders of battalions in which they are a part for immediate screening of troop combat formations against attack by low-flying targets. When air defense is organized these teams must be placed so as to create a continuous zone of coverage. To this same end it is recommended that the teams be located right in the combat formations of the given subunits. As a rule, the organic Redeye SAM section is used to provide battalion air defense. The section's commander, who is responsible for battalion air defense, determines the teams' positions and the procedure for organizing air defense to prevent the influence of air attack weapons on the most likely axes.

The section commander receives data on the enemy from the Chaparral-Vulcan battalion CP and controls the combat actions of the weapon teams using organic communications equipment. The team commander, guided by directions of the section commander and rules of fire against airborne targets, exercises immediate fire control when firing against the air enemy.

As the foreign military press reports, the Army command presently is exploring possibilities of increasing the effectiveness of large-unit air defense. To

this end it is testing new equipment which would allow the transmission and reception of data on airborne targets by all organic and attached air defense subunits of the large units. In particular, it is planned to adapt the radars in the air defense battalion which detect targets at ranges of 16-20 km for transmitting necessary data directly to the Chaparral SAM, Vulcan ZSU and Red-eye SAM teams, equipped with special receiver displays for this purpose. The latter allow the air situation over a territory of 35 km<sup>2</sup> to be displayed. Similar work is being done to couple equipment being received with that presently operational.

In the DEFENSE large-unit air defense must be organized to prevent air attacks against the positions of defending troops in the primary area and against reserves, command posts, communications and control centers, logistical facilities and so on. The primary objective of such air defense is reliable screening of the troops. American military specialists assume that available weapons can be used to organize a more reliable protection for units and subunits against enemy helicopter and aircraft attacks on the defense than in the offensive. In their opinion, this is achieved by deeper echelonment of organic and attached weapons and their even distribution throughout the large unit's defense zone. For the most part, however, the principles for organizing large-unit air defense are approximately the very same as in the offensive.

The Army command recommends placing great emphasis on organizing the air defense of a large unit's subunits and units as they advance from concentration areas or as they make a march in anticipation of a meeting engagement. The Army command believes that it is under these conditions that troops are most susceptible to air attack. Therefore their combat effectiveness and, in the final account, performance of the assigned mission will depend on the organization of air defense.

American military specialists assume that the Vulcan ZSU is an effective weapon for air defense of troops on a march. A ZSU platoon usually is assigned to screen a company. The platoon commander distributes the mounts along the column in such a way that primary efforts are concentrated on screening the column head and tail, where Redeye SAM teams chiefly are located. As the foreign press notes, a concentration of basic efforts of mixed air defense weapons thus is achieved at the extremities of a column, which allows providing reliable troop cover against air attack.

The effectiveness of air defense for troops on the march can be increased by using the Chaparral SAM system, but it is believed advisable to employ these mounts along the troop movement route. In locating them it is recommended that mutual cover be provided, for which the distance between launchers on the march must not exceed 2,000 m.

American military specialists assume that the effectiveness of air defense largely will depend on precise CONTROL. In their opinion, under present-day conditions it is impossible to fight the air enemy successfully without close coordination of the large unit's organic weapons with attached weapons as well as with the air defense subunits of adjacent units, army and tactical aviation, and higher headquarters. All this has to be considered in organizing air defense.

The foreign press reports that overall direction of large-unit air defense is accomplished by the unit commander. A TsUBD is set up from headquarters subunits involved in immediate direction of troop combat actions. Its mission includes providing the commander with information about the current situation. The TsUBD has a group for monitoring the air space, set up from representatives of air defense subunits and army aviation operating in the division zone. It informs the staff and commanders of the large unit and Chaparral-Vulcan air defense battalion about the air situation, transmits general information to air services and together with them determines the overflight zones of friendly aircraft.

A communications and coordination group, located at the command post of the Improved Hawk battalion, is set up to arrange coordination of organic air defense weapons with the Improved Hawk battalion, the army corps air defense brigade, and the tactical air control and warning center. This group warns of a possible enemy air attack, it transmits information on airborne targets and on the rules and procedure for conducting air defense received from the commander of the Improved Hawk battalion, and so on.

Noting the increased troop capabilities to set up a reliable air defense system, the American command at the same time directs attention to those deficiencies presently existing. Above all they include difficulties in controlling all large-unit air defense forces and weapons in repulsing air attacks. The T/O&E of the Chaparral-Vulcan air defense battalion does not provide effective cover for three brigades of mixed forces and weapons. In the opinion of U.S. military specialists, the need for controlling a large number of Red-eye teams and the absence of electronic warfare capabilities at the disposal of the battalion commander require changes to be made in the organizational structure of division air defense subunits. It is for these purposes that they are developing a new organizational structure for the large-unit air defense battalion.

It is planned to include in it in particular three Sergeant York ZSU batteries (developed under the DIVAD [Division Air Defense] program) and two Improved Hawk SAM batteries. In addition, it is planned to include an electronic warfare platoon in the battalion's table of organization. Modern antiaircraft artillery and surface-to-air missile systems will be delivered to the troops. A revision of the principles of their tactical employment and the organization of more effective large-unit air defense are planned in this regard.

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## FOREIGN MILITARY AFFAIRS

### FRENCH ARMY FIELD ARTILLERY

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 38-42

[Article by Maj A. Vasil'yev; passages rendered in all capital letters printed in boldface in source]

[Text] In recent years the French command, closing more and more with the military organization of the aggressive NATO bloc and placing reliance on the development of strategic nuclear forces in its military preparations, has continued meanwhile to place great emphasis on the improvement of tactical nuclear and conventional weapons. New models of artillery systems are being developed along with widescale scientific research to develop neutron ammunition and means of delivering it to the target. It is believed that with its great firepower, significant range of fire and high accuracy in hitting targets, field artillery\* continues to play a major role in fire support to combat actions of ground troops.

The inspector of army artillery exercises overall direction of field artillery, and the commander in chief of army artillery does so in the 1st Army.

In the organizational sense field artillery is divided into corps and division artillery. Artillery units of army subordination are not present in field artillery in peacetime. During mobilization it is planned to deploy nine artillery regiments of the supreme high command reserve (RVGK), each having three batteries of six HM2 105-mm towed howitzers, and to reinforce the army corps with them.

**CORPS ARTILLERY.** Direction of corps artillery is assigned to the artillery chiefs of the army corps. It includes Pluton guided missile regiments (two each in the 1st and 2d corps and one in the 3d), artillery regiments (two each in the 1st and 2d and one in the 3d corps), target reconnaissance regiments (one each in the 1st and 2d corps), as well as artillery subunits of

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\*French military specialists take the term "field artillery" to mean missile, artillery and other systems as well as mortars, which are in the large units, units and subunits of the ground forces and carry out their immediate support in combat--Ed.

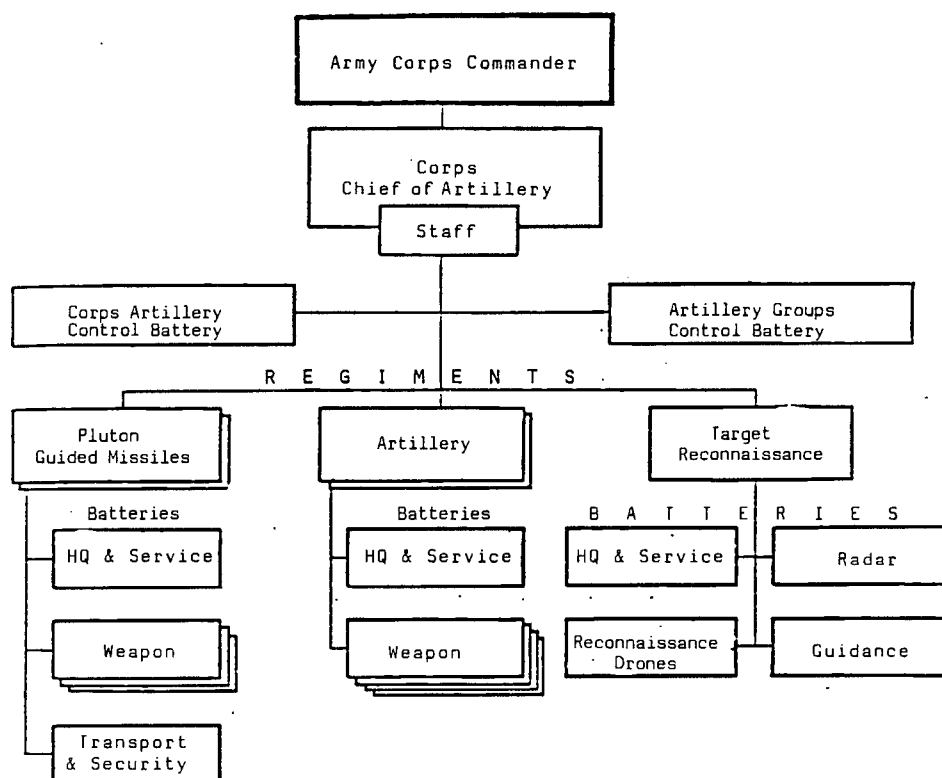


Fig. 1. Organization of army corps field artillery

separate motorized infantry regiments of the army corps. The organization of army corps artillery is shown in Fig. 1.

The PLUTON guided missile regiment (1,060 persons) includes five batteries: headquarters and service battery, three weapon batteries (with two launchers each), and a transportation and security battery. It has six Pluton guided missile launchers, six AMX-10P BMP's [infantry fighting vehicles] and around 300 vehicles of various types. The Pluton guided missile launcher is mounted on the chassis of an AMX-30 tank (Fig. 2 [figure not reproduced]). Its maximum range of fire is 120 km, minimum range is 10 km, and the yield of the nuclear warhead is 10 or 25 KT.

The foreign press emphasizes that Pluton guided missile regiments comprise the basis of corps artillery firepower. They are in a high degree of combat readiness. Regimental commanders and staffs are used extensively for command and staff and troop exercises held at the level of 1st Army and the army corps.

In the opinion of French military specialists, the employment of these regiments in modern warfare will begin with the delivery of a nuclear first strike in which either all the country's nuclear forces including strategic forces may take part, or only tactical nuclear forces. The command for delivering a nuclear first strike comes directly from the French president. It is planned to use Pluton guided missile regiments for destroying and neutralizing enemy means of nuclear attack, other enemy weapons and reserves in the

operational-tactical depth, and disrupting command and control. The Pluton guided missile regiment as a rule is employed centrally. It possesses full autonomy with respect to the organization of control, logistical support and maintenance. The regiment can perform assigned missions at a considerable distance from the army corps command post thanks to a reliable control and communications system as well as high mobility.

The ARTILLERY REGIMENT (900 persons) consists of a headquarters & service battery and four weapon platoons (five pieces each). It has a total of 20 AMX-105A 105-mm self-propelled howitzers (Fig. 3 [figure not reproduced]) or M50 155-mm towed howitzers, six RATAC radars and around 250 APC's and vehicles for various purposes.

The regiment is intended for knocking out command and control points, destroying personnel, weapons, second echelons and reserves in the tactical zone, and providing fire support to the combat actions of its own armored, mechanized and infantry units. It can be employed centrally or it can be attached to large units located on the axis of main corps efforts. In the first instance an artillery group usually is set up on the basis of its subunits, with the group including also artillery regiments of the large units operating on secondary axes. Overall direction of such a group is exercised by the army corps chief of artillery.

The artillery regiment's combat formation is aligned as follows. Several observation and communications groups are sent up to the forward edge (to the unit CP's or directly to combat formations of first echelon subunits), as are 2-3 target designation groups, each with two RATAC radars for detecting targets and adjusting artillery fire. The weapon batteries are located 10-15 km from the forward edge. The distance between their positions must be 3-8 km to preclude the possibility of simultaneous destruction of two batteries by one medium-yield nuclear weapon. The regiment's logistical subunits and its CP are located behind the combat formations of the weapon batteries.

The TARGET RECONNAISSANCE REGIMENT (900 persons) is intended for reconnoitering enemy targets in the army corps combat zone. It includes four batteries: headquarters and service battery, reconnaissance drone battery, radar battery and guidance battery. It has 20 R-20 reconnaissance drones, eight radars and more than 200 pieces of various equipment.

The ARTILLERY SUBUNITS of separate motorized infantry regiments of the army corps each have six MO-120-RT-61 (Fig. 4 [figure not reproduced]) and MO-120-M65 120-mm mortars as well as eight 81-mm mortars. Their fire is controlled by the commanders of units and subunits in which they are included organizationally. Centralized control at corps level is not precluded during fire preparation of an attack, in repulsing counterattacks on the defense and in accomplishing certain other missions.

DIVISION ARTILLERY. Each army division has an artillery regiment as well as artillery subunits which are included organizationally in the mechanized, motorized infantry and infantry units. The division artillery is directed by the division commander through the artillery regiment commander.

The ARMORED DIVISION ARTILLERY REGIMENT (900 persons) consists of a headquarters and service battery and four weapon batteries (five pieces each). It has 20 F.3 155-mm self-propelled guns (Fig. 5 [not reproduced]), 6 RATA radars, and 270 pieces of equipment including 52 pieces of armored equipment. In addition, the mortar platoons of headquarters and service companies of the division's two mechanized regiments each have six 120-mm mortars.

The INFANTRY DIVISION ARTILLERY REGIMENT (800 persons) includes five batteries: a headquarters and service battery, four weapon batteries (each with six M50 155-mm howitzers on mechanical traction), and 200 APC's and vehicles. In addition to this, each of the three infantry regiments has six 120-mm and eight 81-mm mortars. The infantry division has a total of 24 M50 155-mm howitzers on mechanical traction, 18 120-mm mortars and 24 81-mm mortars.

The 11TH AIRBORNE DIVISION ARTILLERY REGIMENT (860 persons) has a headquarters & service battery and three weapon batteries each with six 120-mm mortars, and more than 200 APC's and vehicles. The division's airborne regiment (a total of six) has six 120-mm and eight 81-mm mortars. The division has a total of 54 120-mm and 48 81-mm mortars.

The 27TH ALPINE INFANTRY DIVISION ARTILLERY REGIMENT (around 700 persons) consists of a headquarters and service battery and four weapon batteries (six 105-mm towed howitzers), and also has up to 200 pieces of wheeled and tracked equipment. In addition, each of the six alpine infantry battalions has six 120-mm mortars and six 81-mm mortars. The division has a total of 24 105-mm howitzers, 36 120-mm mortars and 36 81-mm mortars.

The 9TH MARINE INFANTRY DIVISION ARTILLERY REGIMENT (700 persons) includes a headquarters and service battery and two weapon batteries (each with six 105-mm towed howitzers). It has 12 105-mm towed howitzers and more than 200 different vehicles. Each of the four marine motorized infantry (infantry) regiments has six 120-mm and eight 81-mm mortars. The division has a total of 12 105-mm howitzers, 24 120-mm mortars and 32 81-mm mortars.

Artillery regiments of division subordination can operate both in the interests of their own large units and to perform fire missions at the army corps level. Their combat formation is set up in the very same manner as that of artillery regiments of corps subordination. The division's artillery regiment commander is at the large-unit commander's CP during combat actions. He draws up suggestions for the division commander on employment of field artillery and controls the regiment's actions in combat. A liaison officer is with him constantly for this purpose. The deputy artillery regiment commander is located at the regimental CP and controls the fire of batteries directly in accordance with orders transmitted from the division CP.

In addition to corps and division artillery the ground troops have artillery subunits which are a part of the 31st Separate Brigade (a battery of F.1 155-mm self-propelled howitzers with five pieces, Fig. 6 [figure not reproduced], 12 120-mm mortars and 10 81-mm mortars), as well as in units stationed in West Berlin and on overseas territories (eight 155-mm and 12 105-mm towed howitzers, 18 120-mm and 108 81-mm mortars).

As the foreign military press reports, army field artillery has a total of five Pluton guided missile regiments, 20 artillery regiments (five with corps and 15 with division subordination), and two target reconnaissance regiments. They have 30 Pluton guided missile launchers, more than 400 field artillery pieces, around 700 mortars and 40 reconnaissance drones.

In accordance with the program adopted for building up the armed forces and in order to increase the firepower of ground troops the French command is planning to develop more advanced artillery systems and outfit appropriate units and subunits with them. For example, a new Hades missile system is being developed at the present time with a range of fire up to 300 km; it is to replace the Pluton guided missiles in the 1990's. Tube artillery also is being improved, with the caliber of weapons being increased, their rate and range of fire increased, guided artillery projectiles being developed, and the mobility of artillery systems being improved.

French military specialists believe that artillery regiments must have guns (howitzers) with a caliber of at least 155 mm. Based on this, the army command is planning to rearm all artillery regiments which have had 105-mm guns to this date with 155-mm howitzers and guns. In particular, by the beginning of 1990 it is planned to have the F.1 155-mm self-propelled guns (previously designated the 155 CGT) in the RVGK artillery regiments of corps subordination and the armored divisions in place of the HM2 105-mm towed howitzers, M50 155-mm towed howitzers and F.3 155-mm self-propelled guns (respectively). The total number of pieces will be increased from 20 to 24 (six in each battery), which will increase the regiment's fire capabilities considerably. For example while a regiment which presently has 20 F.3 155-mm self-propelled guns is capable of firing 120 rounds in two minutes and destroying enemy personnel and weapons in an area of 3 hectares, after the indicated measures have been taken it will be able to fire 144 rounds in 45 seconds and hit targets in an area of 10 hectares. During this same period it is planned to réarm artillery regiments of the infantry divisions with new 155TR 155-mm towed howitzers (Fig. 7 [figure not reproduced]).

French specialists plan to achieve an increase in the range of fire by improving the guns' ballistic characteristics and the projectiles' aerodynamic shape and by developing rocket-assisted projectiles. At the present time a fragmentation-HE round with improved aerodynamic shape has been developed, which allowed reducing drag and increasing the range of fire by approximately 16 percent. The unit of fire of the new F.1 155-mm self-propelled gun will include rocket-assisted projectiles which will make it possible to increase the range of fire to 30 km. The range of fire from the 120-mm mortar with rifled tube will increase from 8.3 to 13 km thanks to the use of rocket-assisted mortar projectiles.

Work continues at the present time to improve multiple launch rocket systems [MLRS's] to increase their range of fire. The RAP-14 22-tube 140-mm towed MLRS with a range of fire of 16 km and area of destruction of 10 hectares is being tested and the Rafale 30-tube 145-mm MLRS is being developed. France is participating along with the United States, the FRG and Great Britain in the development and manufacture of the MLRS, the first models of which are being troop tested.

Much attention is being given to developing new equipment for supporting field artillery fire and fire control. The ATILA automated artillery fire control system is being delivered. It allows the computation of necessary firing parameters, automatically processes incoming reconnaissance data and so on. Artillery regiments are being outfitted with laser rangefinders and the Sirocco meteorological radars. It is planned to supply target reconnaissance regiments with new Argus radars on a tethered platform (with a detection range up to 60 km) and CL89 reconnaissance drones.

In the Army command's assessment the amount of field artillery in the French Army in comparison with armies of the United States, the FRG and a number of other capitalist countries is insufficient for reliable fire support to combat actions of army corps and divisions. This is why special significance is attached to re-equipping field artillery and to improving its T/O&E. It is assumed that the tactical capabilities of field artillery will be doubled with the introduction of the new equipment.

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## FOREIGN MILITARY AFFAIRS

### TANK GUN AMMUNITION

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 42-46

[Article by Engr-Col Ye. Viktorov; passages rendered in all capital letters printed in boldface in source]

[Text] Believing tanks to be an important means for accomplishing their aggressive plans, the U.S. and NATO leadership is conducting extensive measures for a further improvement in these fighting vehicles, and above all for building up their fire capabilities including through the development of new ammunition.

The mission of fighting enemy tanks in armies of capitalist countries is assigned both to special antitank weapons, and above all ATGM's [antitank guided missiles], as well as to battle tanks themselves. In the opinion of foreign specialists, the armament of the latter also has to ensure successful accomplishment of many other fire missions in neutralizing diverse targets on the battlefield.

A tank's most important combat feature which allows it to combat armored vehicles successfully, hit unprotected or area targets, and counter enemy helicopters and low-flying aircraft is its firepower, determined primarily by the characteristics of its guns and ammunition. As the foreign press notes, one of the basic requirements placed on the tank gun in the armies of NATO countries is the capability of conducting effective fire against armored targets at ranges up to 3,000 m, and against unprotected and area targets up to 5,000 m. Meanwhile, in the assessment of western military specialists, the European war theater's terrain relief permits aimed fire from the tank gun to be conducted almost everywhere at ranges of no more than 2,000 m. It is noted that the probability of hitting stationary targets in firing the guns of existing tanks at this distance is 0.3-0.5. A further improvement in fire accuracy and target kill probability is possible thanks to the use of integrated automated fire control systems and by improving guns and ammunition.

The present-day foreign level of development of tank ammunition is determined by scientific-technical achievements primarily in the United States, the FRG,

Great Britain, France and Israel, which were implemented in developing rounds for the 105-mm and 120-mm guns with which these countries' present-day tanks are armed. As a rule, it is planned to mount the 120-mm guns on the tanks presently under development, which is why greatest importance is attached to improving ammunition of this caliber.

The 105-MM RIFLED GUN presently is on the bulk of tanks in capitalist armies. Even the new American Abrams M1 tank is armed with it for now. The unit of fire includes quick firing fixed rounds with projectiles of five types.

The M392 armor-piercing discarding sabot [APDS] projectile has a rather large muzzle velocity (1,478 m/sec), providing an improvement in fire accuracy and armor penetration. The latter also depends on the shell's weight, the ratio of its length to its diameter, angle of impact with the armor and the armor's protective characteristics. The projectile consists of an active (flying) part, which is a steel body with a core of tungsten carbide, and a sabot which separates after the round is fired. According to foreign press reports, the M392 projectile penetrates armor up to 120 mm at a range of 2,000 m and an angle of impact of 60°. In the opinion of foreign specialists, however, it is insufficiently effective when fired against multilayered armor designs.

In comparison with the M392, the M456 shaped-charge projectile has greater armor penetration when fired against monolithic armor. It is noted that it can penetrate armor with a thickness greater than three klb [calibers] of a shaped charge, and this value depends almost not at all on the projectile's speed of flight along its entire path. At the same time, its accuracy of fire is lower because of a lesser muzzle velocity (1,170 m/sec), limited by permissible values of overloads on the shell body during firing and by somewhat worse external ballistic characteristics. It is believed that the lethality of the shaped charge is degraded if it is rotating at the moment the charge detonates, since conditions for forming the hollow-charge jet sharply deteriorate under the effect of centrifugal forces.

The M393 armor-piercing-HE shell has a thin-walled body filled with plastic VV [explosive] with a high detonation rate. When the projectile impacts against armor its head deforms, increasing the area of contact with the obstacle. The VV detonates from the base fuze and a detonation wave is formed, directed at a right angle to the obstacle surface and destroying homogeneous armor up to 200 mm thick. Fragments break off from the rear surface of the armor and have a considerable casualty effect behind the armor. In addition to combating tanks, such shells can be used for destroying field fortifications and lightly armored and unarmored equipment. In the opinion of foreign specialists, the deficiencies of the M393 are its low muzzle velocity (730 m/sec) and weak effect against multilayered and distributed armor.

The M494 projectile with preformed flechettes detonates along the trajectory from the triggering of a time fuze. The head of the body is demolished and a bursting charge in the base triggers and throws the flechettes forward, injuring unprotected personnel in a rather large area.



The M416 smoke shell is used for blinding observation and command posts as well as artillery and ATGM firing positions. A smoke-producing substance is pressed into its body and within the substance is a bursting primer charge. A percussion fuze is located in the head of the body. When the shell bursts there is a simultaneous ignition of the smoke-producing substance (white phosphorus), which is thrown out in a radius of several tens of meters.

As the foreign press notes, the ammunition already mentioned, especially the armor-piercing projectiles, by the middle of the 1970's no longer fully met the requirements for combating tanks, which had more effective protection in comparison with previous vehicles thanks to the use of combination and distributed multilayered armor. As a result the armor-piercing, discarding sabot, fin-stabilized projectile was developed, characterized by high armor penetration at low angles of impact with monolithic armor and in acting against combination and distributed armor. It has an elongated arrow-shaped core (with a length-to-diameter ratio of at least 12) with a fin assembly. The optimum materials for the core, in which high mean density is combined with sufficient strength, are a heavy alloy of tungsten, nickel and iron or an alloy containing depleted uranium. By using an obturator (made of two sliding driving bands) which fills the space between rifling of the bore and the projectile in the design of the finned projectile, the projectile's excessive twisting while moving along the bore of a rifled gun is prevented. A projectile of this design with a tungsten core (a diameter of 33 mm) was developed in Israel in the early 1970's for the 105-mm gun mounted on the M48, M60A1, Centurion and Merkava tank in the inventory of this country's ground troops. It was designated the M111 (Fig. 1 [figure not reproduced]). In 1978 it began to be produced under license in the FRG for the Leopard-1 tanks (the West German designation is DM23).

The M735 and M774 projectiles with cores of tungsten and depleted uranium respectively were developed in the United States at approximately the very same time as in Israel. They now have been placed into series production.

The M735 armor-piercing discarding sabot fin-stabilized projectile (Fig. 2) consists of a steel body, a core of tungsten carbide and a tip made of a light alloy. A variant of the projectile (M735A1) also was developed with a solid core of an alloy containing depleted uranium ("stabilla"). The foreign press notes that in addition to improved armor penetration, such a core also is characterized by better behind-the-armor action as a result of the fact that, along with a large number of red-hot fragments, a flame of very high temperature forms, leading to the occurrence of a fire within the tank. A certain degree of radioactivity of the uranium core also is an additional factor in crew injuries.

The M735 projectile has a device to prevent heavy twisting as it moves along the bore. The device consists of two concentric rings operating as an obturating band. According to foreign press reports the smooth sabot separation and stabilizing effect of the tail fin give the projectile a rather high firing accuracy. For this reason American specialists tried to improve armor penetration during further developments, with retention of the extent of shell dispersion which had been achieved. To do this they looked for new design

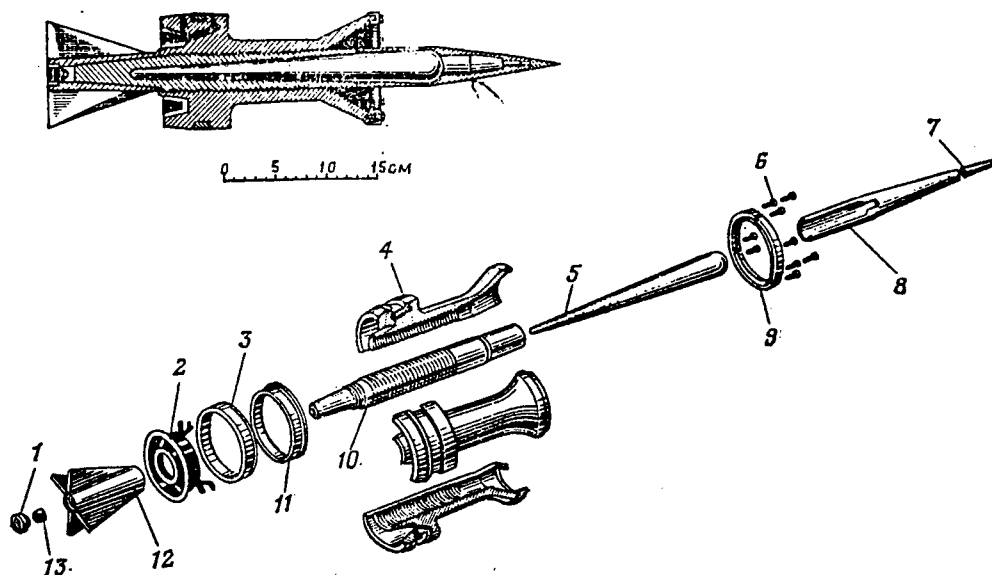


Fig. 2. American M735 composite shot:

1. Tracer nut
2. Obturator base
3. Outer (rotating) obturator ring
4. Sabot segments
5. Core
6. Bolts
7. Small tip
8. Large tip
9. Sabot guide ring
10. Body
11. Inner obturator ring
12. Tail fin
13. Tracer compound

solutions. For example, the active part of the M774 projectile does not have a steel core, but is a solid core of depleted uranium (the length-to-diameter ratio is 14). The XM833 armor-piercing discarding sabot fin-stabilized projectile being developed also will have a solid and more elongated core of around 24 mm in diameter made of an alloy of depleted uranium.

The multipurpose XM815 projectile, which is fin-stabilized in flight, is being developed to replace the M456 shaped-charge projectile. Ongoing development is pursuing the goal to have not simply an antitank projectile, but one with a good shaped-charge and fragmentation-HE effect. The opinion is being expressed in the United States in this regard that it will be sufficient to have rounds in the unit of fire of the organic 105-mm rifled gun only with the new armor-piercing discarding-sabot and multipurpose (shaped-charge-fragmentation) projectiles. Development of new models to replace the M393 and M494 is considered inexpedient.

The types of projectiles which make up the units of fire of tank guns are determined by the views of military specialists in capitalist countries on the tactical missions which tanks must perform. Units of fire of American tanks are characterized by the most complete product list of projectiles. There are armor-piercing discarding-sabot, shaped-charge, and armor-piercing-HE projectiles for the 105-mm gun of the West German Leopard-1 tank, and they correspond to American models in their characteristics. France previously had shells only of two types for the 105-mm rifled gun of the AMX-30 tank: shaped-charge and fragmentation-HE. To reduce the rotation rate in the first type the shaped charge is accommodated in the shell body on two roller bearings. A round lately was developed for this gun with an armor-piercing, discarding-sabot, fin-stabilized projectile (Fig. 3 [figure not reproduced]) having a core of tungsten alloy containing nickel and copper. The round weighs 17.1 kg (the projectile weighs 5.8 kg), is 985 mm long, with a core diameter of 27 mm and a projectile muzzle velocity of 1,525 m/sec. According to foreign press information, at a range of 1,000 m it penetrates armor 370 mm thick at a 90° angle of impact.

A round developed in Great Britain with the L64A4 armor-piercing, discarding-sabot, fin-stabilized projectile (Fig. 4 [figure not reproduced]) is considered one of the most effective. The round weighs 18.9 kg (the projectile weighs 6.12 kg), has a length of 948 mm, a core diameter of 28 mm and a muzzle velocity of 1,490 m/sec. The core is made of an alloy containing 90 percent tungsten, 7.5 percent nickel and 2.5 percent copper.

Until the late 1970's only the British Chieftain tank had a 120-MM GUN. In 1979 the West German Leopard-2 tank with a 120-mm smoothbore gun was adopted by the Bundeswehr. In the opinion of foreign specialists, rather advanced ammunition has been developed for it. There are two types of standard fixed rounds (with combustible case and metal sabot): the DM12 with a shaped-charge-fragmentation fin-stabilized projectile and the DM13 with armor-piercing discarding-sabot projectile (Fig. 5 [figure not reproduced]). The first (weighing 13.5 kg and with a muzzle velocity of 1,140 m/sec) is intended for fire against armored vehicles, reinforced protective works and unprotected targets. It penetrates armor around 220 mm thick at a 60° angle of impact. The second projectile (weighing 4.64 kg without the discarding sabot and with a muzzle velocity of 1,650 m/sec) has an elongated tungsten alloy core. It is intended for destroying armored targets, primarily tanks. Its armor penetration is up to 190 mm at a range of 2,000 m and a 60° angle of impact. According to foreign press reports, an improved version of this munition presently has been developed, designated the DM13A1. Its core (with a diameter of 32 mm) has greater penetrative performance.

Beginning in 1985 it is planned to produce the American Abrams M1 tanks with a 120-mm smoothbore gun (as on the Leopard-2 tank), manufactured in the United States under a West German license. Rounds are being developed for it with the XM827 and XM829 armor-piercing, discarding-sabot, fin-stabilized projectiles (with armor penetration of around 220 and 230 mm respectively at a range of 2,000 m and a 60° angle of impact). The XM827 projectile is being developed on the basis of the West German DM13 munition (and will be interchangeable with it) under an accelerated program in order to make it operational by

the beginning of production of the Abrams M1 tank with the 120-mm gun. In comparison with the DM13, the round with the XM827 projectile will have improved projectile elements, casing and powder charge. A core 38 mm in diameter is made of the "stabilla" alloy. It is planned to complete development of the round with the XM829 projectile (Fig. 6 [figure not reproduced]) with a core (diameter of 28 mm) of depleted uranium alloy somewhat later. The XM832 fin-stabilized practice shell also is being developed. It is also planned to have the XM830 multipurpose shell (shaped-charge and fragmentation effect) for firing from the 120-mm gun of the Abrams M1 tank. It will be the American version of the West German DM12 munition without substantial changes.

France also has developed a 120-mm smoothbore gun for the new AMX-32 and AMX-40 tanks. Rounds have been developed for the gun with an armor-piercing, discarding-sabot, fin-stabilized projectile (weighing 6.2 kg with sabot, muzzle velocity of 1,630 m/sec) and with a shaped-charge projectile (muzzle velocity of 1,050 m/sec). Their armor penetration characteristics are close to corresponding indices of West German models. There is also a practice round weighing 19 kg, 850 mm long, with a projectile weight of 1.7 kg less sabot, and a projectile muzzle velocity of 1,800 m/sec.

The unit of fire for the 120-mm rifled gun of the British Chieftain tank includes separate loading rounds with armor-piercing discarding-sabot projectiles, armor-piercing-HE projectiles and smoke shells stabilized in flight by rotation. Since the latter half of the 1970's Great Britain has been developing rounds with an armor-piercing, discarding-sabot, fin-stabilized projectile and an advanced armor-piercing-HE, fin-stabilized projectile, which will be included in the unit of fire of the Challenger tank. The core of the armor-piercing, discarding-sabot projectile is made of tungsten alloy. According to British specialists, it penetrates the armor of modern tanks (except for frontal armor) at ranges up to 4,000 m. Thanks to better ballistic characteristics (increased muzzle velocity and less air resistance), the armor-piercing-HE shell is distinguished by rather high accuracy of fire.

It follows from statements of western military specialists that at the present time helicopters armed with ATGM's represent great danger for tanks. Special ammunition is being developed for tank guns to combat them. For example, a new round with a fragmentation-HE, discarding-sabot, fin-stabilized projectile (Fig. 7 [figure not reproduced]) with preformed lethal elements in the form of metal balls is being developed in the FRG for the 105-mm gun. It is noted that when such a shell is used the target kill probability with the first round may be 0.85, while it does not exceed 0.15 when firing existing ammunition.

Specialists in foreign countries are trying to find new technical solutions for a further improvement in the effectiveness of fire from tank guns. For example, the American firm of Northrop received an order back in 1977 for development and testing of a system for guiding a tank gun projectile by a laser beam, which is to provide high kill probability with the first round at long ranges. It is believed that the projectile will carry a shaped charge

similar to the ATGM warhead. An armor-piercing, discarding-sabot, rocket-assisted projectile being developed in the FRG also should be distinguished by a high armor penetration. The projectile retains very high velocity thanks to a rocket motor which operates along the entire flight path.

American specialists consider the development of fundamentally new tank guns, from which a projectile is fired by a charge of liquid propellant, to be one of the ways for improving the firepower of future tanks.

Foreign military experts assume that despite certain difficulties in the work of making further improvements to existing ammunition for tank guns and developing new, more effective ammunition, there still are significant possibilities in this area (with consideration of the use of the latest scientific achievements). Although this requires enormous funds, nevertheless the governments of western countries are assuming such expenditures, which indicates their desire to achieve military-technical superiority over states of the socialist community.

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## FOREIGN MILITARY AFFAIRS

### SPANISH ARMY WEAPONS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 46-50

[Article by Engr-Lt Col N. Fomich; passages rendered in all capital letters printed in boldface in source]

[Text] In 1982 Spain became the 16th member of the aggressive North Atlantic Alliance. It long had drawn attention from the NATO leadership thanks to its important strategic position. At the present time measures are being taken in this country to increase the combat capabilities of its Armed Forces, including through their outfitting with modern weapons and combat equipment. Judging from foreign press reports, greater attention is being given to the basic branch of the Armed Forces, the Army, which has 255,000 persons in five divisions and 16 separate brigades.\* They are outfitted primarily with weapons of American, French and West German manufacture. At the same time, some models of weapons, especially light arms, are produced in Spain itself.

SMALL ARMS (Table 1) are represented by the following models: the Super Star 9-mm pistol, the Star 9-mm machine pistols in the modifications Z-45, Z-62 and Z-70/B, the Cetme Mod C 7.62-mm automatic rifle (Fig. 1 [figure not reproduced]), the Cetme Mod L 5.56-mm automatic rifle, the West German MG42/59 and MG3 7.62-mm general purpose machineguns and the American M1919A4 and M2HB Browning machineguns of 7.62-mm and 12.7-mm caliber respectively. In the opinion of foreign specialists, the Cetme Mod L automatic rifle, which became operational in the Spanish Army in the early 1980's, is the most advanced. At the present time an experimental model of a 5.56-mm light machinegun (belt capacity of 200 cartridges) also has been developed.

ANTITANK WEAPONS include antitank rocket launchers (RPG's), recoilless guns and antitank missile systems (PTRK's). The M-65 88.9-mm RPG (weighing 5.4 kg) is designed for combating armored targets at ranges up to 400 m. The shaped charge of the rocket penetrates armor some 330 mm thick. As the foreign press reported, testing has begun on the C-90B rocket launcher, with which it is planned to replace the M40A1 106-mm recoilless guns produced in Spain under an

\*For more detail on the Spanish Army see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 5, 1983, pp. 23-27--Ed.

Table 1 - Combat Characteristics of Small Arms

Model	Weight, kg	Length, mm	Gun Range	Rate of Fire, rounds/min	Magazine (Belt) Capacity, rounds
Super Star 9-mm pistol.....	1,02	204	50	36	9
Star Mod Z-62 9-mm machine pistol.....	3,55	480 <sup>1</sup>	200	100	20, 30, 40
Cetme Mod C 7.62-mm automatic rifle.....	4,5	1015	500	100	20
Cetme Mod L 5.56-mm automatic rifle.....	3,4	925	400	120	10, 20, 30
MG3 7.62-mm general purpose MG	25 <sup>2</sup>	1225	1200	250	50 (250)
M2HB 12.7-mm Browning MG	58 <sup>2</sup>	1653	1800	100	(100)

1. Length with extended butt 701-mm.
2. MG weight with mounting.

American license and presently in the inventory. Effective fire can be conducted from the new RPG against moving tanks at a distance up to 200 m, and against stationary targets up to 350 m (the armor penetration is around 450 mm).

The Cobra, Dragon, Milan (Fig. 2 [figure not reproduced]), TOW and HOT ATGM systems are in army subunits (the HOT ATGM's are mounted on BO-105P fire support helicopters). Their combat characteristics are given in Table 2.

Table 2 - Combat Characteristics of Antitank Guided Missiles

Model (Developed by:)	Weight, kg:	Missile Length, mm Diameter	Flight Speed, m/sec	Range of Fire, meters	Armor Thickness Penetrated, mm	Control System
	Missile Warhead			Minimum Maximum		
SS-11 (France)	28,4	1160	190	500	600	Manual by wire
	6	164		3500		
Cobra (FRG)	10	950	85	400	500	"
	2,5	100		2000		
Dragon (USA)	6,12	745	110	30	400	Semiautomatic, IR, by wire
	2,5	123		1000		
Milan (France, FRG)	6,6	770	200	25	500	"
	2,9	90		2000		
TOW (USA)	17	1140	210	65	500	"
	3,6	140		3750		
HOT (France, FRG)	22	1270	260	75	550	"
	6	132		4000		

ARTILLERY WEAPONS (Table 3) primarily are represented by American models. The Army has a total of more than 1,000 self-propelled and towed field artillery pieces in calibers 105-203.2 mm, including the American M108, M109 (Fig. 3 [figure not reproduced]), M110 and M107 SAU [self-propelled artillery mounts]. The Territorial Defense Troops also have a certain number of obsolete 122-mm and 105-mm howitzers and 75-mm guns of Spanish manufacture.

The D-10 (Fig. 4 [figure not reproduced]) and E-21 multiple launch rocket systems [MLRS] (10 and 21 rails respectively) are intended for delivering strikes

Table 3 - Combat Characteristics of Artillery Weapons

Model (Developed by:)	Combat Weight	Round Weight, kg	Maximum Range of Fire, km	Rate of Fire, rounds/min	Speed, km/hr
		Muzzle Velocity, m/sec		Unit of Fire, rounds	Range, km
M115 203.2-mm towed howitzer (USA).....	13.4	90.7 594	16.8	0.5 - 1 .	—
M110 203.2-mm self- propelled howitzer (USA)	26.5	90.7 597	16.8	0.5 - 1.5 2'	55 730
M107 175-mm self-propelled howitzer (USA)	28.2	66.8 914	32.6	0.5 - 2 2'	55 730
M114A1 155-mm towed howitzer (USA)	5.8	43.5 504	14.6	4 .	—
M109 155-mm self-propelled howitzer (USA)	23.8	43.5 564	14.6	3 28	58 390
M101A1 105-mm towed howitzer (USA)	2.2	. 473	11	8 .	—
M108 105-mm self-propelled howitzer (USA)	22.4	17.5 610	11.5	5 87	56 390
105-mm mountain howitzer (Italy)	1.3	14.9 420	10.5	3 - 6 .	—
L70 40-mm antiaircraft gun (Switzerland)	5.15	. 1000	4'	300 122	—
M63 35-mm twin antiair- craft mount (Switzerland)	6.7	0.55 1175	4'	2 x 550 238 1000	—
GAI-B01 20-mm antiaircraft gun (Switzerland)	0.38	0.125 1100	2'	. 12	—
Mod L 120-mm mortar (Spain)	0.33	13.2 .	6.25	. 15	—
Mod L-N 81-mm mortar (Spain)	0.04	3.2 .	4.1	. 30	—
Comando 60-mm mortar (Spain)	0.007	1.43 .	1	. .	—

1. The remaining ammunition is carried on a transport vehicle.
2. Maximum effective range of fire against airborne targets.

against area targets. The caliber of the free-flight rockets (NUR) is 300 mm and 216 mm and the range of fire is 17 and 14.5 km. The launchers are mounted on the chassis of a five-ton truck. The NUR's are fitted with fragmentation-HE, incendiary and smoke warheads. According to foreign press reports, there also is the G-3 381-mm MLRS (eight rails) with a range of fire up to 23 km. Spanish specialists also have developed a test model of the Teruel 140-mm 40-tube system, presently undergoing testing.

Mortars have seen considerable development in Spain. The ground troops are outfitted with mortars of Spanish production in the calibers of 60, 81, 105 and 120 mm (Fig. 5 [figure not reproduced]). There are some 400 units of the latter caliber.

AIR DEFENSE WEAPONS include missile systems and tube artillery. The American Nike Hercules and Improved Hawk SAM systems, with which it is possible to hit



airborne targets at ranges up to 140 and 40 km and at altitudes of 45 and 18 km respectively, are in the Spanish Army inventory. As the foreign press noted, it is planned to purchase 96 American Chaparral short-range SAM systems (1,760 missiles) and 28 Swiss Skyguard-Sparrow systems for the ground troops.

Towed antiaircraft guns in the calibers of 90, 40, 35 and 20 mm, primarily of Swedish and Swiss production, are widely used to combat low-flying targets. For example, in the subunits of troop air defense there are some 280 Swedish L70 40-mm automatic guns. The M63 35-mm twin antiaircraft mount (the Oerlikon GDF-001) is considered an effective weapon.

Table 4 - Combat Characteristics of Armored Equipment Models

Model (Developed by:)	Combat Weight tons.	Dimensions, m:	Weapon Caliber, mm:	Engine Rating, hp	Maximum Speed, km/hr
	Crew (Can Carry)	Height Length* x Width	Main Gun Machineguns		Range, km
AMX-30 tank (France)	<u>36</u> 4	<u>2.85</u> 6.6 x 3.1	<u>105</u> 12.7 & 7.62	720	<u>65</u> 500
M48E tank (USA)	<u>48</u> 4	<u>3</u> 6.9 x 3.6	<u>105</u> 12.7 & 7.62	750	<u>48</u> 480
M47 tank (USA)	<u>46</u> 5	<u>2.9</u> 6.4 x 3.5	<u>90</u> 12.7 & two 7.62	810	<u>48</u> 130
M41 light tank (USA)	<u>23.5</u> 4	<u>2.7</u> 5.8 x 3.2	<u>76</u> 12.7 & 7.62	500	<u>72</u> 160
M113 tracked APC (USA)	<u>11</u> 1 (12)	<u>2.2</u> 4.8 x 2.7	<u>—</u> 12.7	215	<u>68</u> 480
BMR-600 wheeled APC (Spain)	<u>16</u> 3 (10)	<u>2</u> 6.15 x 2.5	<u>—</u> two 7.62	306	<u>110</u> 900
Panhard M3 wheeled APC (France)	<u>6.1</u> 2 (10)	<u>2</u> 4.45 x 2.4	<u>—</u> 7.62	90	<u>100</u> 600
AML-90 Panhard armored car (France)	<u>5.5</u> 3	<u>2.1</u> 3.68 x 1.97	<u>90</u> 7.62	90	<u>90</u> 600

\*Length of the hull is given.

ARMORED EQUIPMENT (Table 4). The tank inventory numbers more than 1,000 vehicles, of which there are some 300 French AMX-30 tanks (Fig. 6 [figure not reproduced]), 130 American M48 tanks, 390 M47 tanks, and up to 200 M41 light tanks. The AMX-30 tanks are manufactured by the Santa Barbara firm under a French license.

In the latter half of the 1970's Spanish specialists began modernizing the M48 and M47 tanks (which were designated the M48E and M47E), the basic purpose of which was to increase their firepower and mobility (the 90-mm guns on the M48 were replaced with the British 105-mm rifled gun). The fire control system (SUO), which includes a laser rangefinder and electronic ballistic computer, contains around 70 percent components of the SUO of American M60A3 tanks produced by the Hughes firm. The majority of elements of this system are manufactured in Spain under an American license. In addition, diesel engines and hydromechanical transmissions have been installed on both tanks in place of carburetor engines, which allowed increasing the speed and range.

The foreign press announced the Spanish command's intent to purchase the West German Leopard-2 tanks for the Army after the country entered the NATO bloc. It is planned to produce a considerable number of them in Spain under license from the Krauss-Maffei firm.

The French Panhard AML-90 and AML-60 armored vehicles, which number 80 and 60 respectively, are used to perform reconnaissance along with the American M41 light tanks. They differ only in weapons.

Infantry is transported primarily in American M113 tracked APC's (around 500 units). There also is a certain number of French Panhard M3 wheeled APC's. In the late 1970's the Army began to receive the BMR-600 amphibious wheeled APC's developed and produced by Spain (see color insert [color insert not reproduced]). Initially it was planned to purchase approximately 500 of the APC's and various vehicles based on them, including reconnaissance, command and staff, and medical vehicles.

ARMY AVIATION subunits have some 150 helicopters of various types, of which there are 50 American Iroquois UH-1B/H multirole helicopters and 60 West German BO-105P helicopters (28 are made in the antitank version, armed with the HOT ATGM's). There also are American Kiowa OH-58A reconnaissance helicopters and the Chinook CH-47D assault transport helicopters.

On the whole, in the opinion of foreign specialists, the Spanish Army is outfitted with a rather large amount of varied weaponry, but many models already are obsolete. Meanwhile the Spanish Army command believes that implementation of a program for modernizing the Armed Forces (during 1983-1990) will permit a substantial improvement in combat capabilities of the country's ground troops inasmuch as the country joined the NATO bloc.

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## FOREIGN MILITARY AFFAIRS

### MODERN FIGHTER IN AERIAL COMBAT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 53-58

[Conclusion of article by Col V. Kirillov, candidate of military sciences; passages rendered in all capital letters printed in boldface in source]

[Text] The first part of the article\* gives a formula developed by western military specialists for a fighter's capability to conduct aerial combat and examines the factors of electronics and weapons included in the formula. Such factors as maneuverability, deceleration and invulnerability will be partially analyzed below according to foreign press data.

The MANEUVERABILITY FACTOR in the formula incorporates thrust-to-weight ratio, unit wing load, and the value reflecting the effects of high-lift devices. According to views of western military experts, these are the characteristics of aviation equipment which are the basis for the first element in the "maneuver-fire" system, which reveals the essence of close combat. Concerning the latter, the American journal AIR FORCE wrote: "The conclusion which can be drawn from an analysis of future air operations, mathematical modeling, the results of flight tests and the experience of air combat operations in South-east Asia and the Near East is that close aerial combat is realistic and fighters must be capable of performing it."

The journal INTERNATIONAL DEFENSE REVIEW wrote that an analysis of more than 100,000 combat sorties flown in Vietnam and in the Near East by aircraft capable of developing a speed of  $M = 2.2$  showed the following: almost not a single minute of flight at speeds of  $M \geq 1.6$  was registered; the range of speeds  $M = 1.2-1.6$  was used little; and the overwhelming number of combat operations and maneuvering in aerial combat was accomplished at speeds of  $M = 0.6-1.2$  and at altitudes below 6,100 m. This situation was determined by the fact that the pilot was governed by one desire in maneuverable combat: to turn toward the enemy as quickly as possible. The maximum angular velocity of a turn at which engine thrust and the aircraft's aerodynamic qualities have optimum correlation is reached while flying at a speed of  $M = 0.8 \pm 0.1$ . Maneuvering at

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\*See ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1984, pp 47-54--Ed.

M1 provided no substantial gain in the speed of changing the flight direction. The pilot could only make brief use of a higher instantaneous rate of turn (high-g's up to 6 at  $M = 1.5$ ), since the aircraft quickly moved into the transonic speed range because of negative acceleration ("deceleration") which arose.

Because of the requirements to achieve a flight speed of  $M = 2.2$  second generation fighters had a number of substantial deficiencies in addition to high cost which had a negative influence on their preparation for a sortie and employment in combat. The aircraft weight was too great, which made it inert. Cumbersome and sophisticated equipment demanded considerable inputs of time and effort to service it, resulting in a reduction in the number of combat sorties during a flying day or night, and so on.

In studying the tactical capabilities of aircraft of the 1960's-1970's, western military experts developed charts for the so-called average or typical fighter (flying with full payload and a 50-percent fuel reserve). The charts could be used to determine areas of the aircraft's stable maneuvering with a varying overload (Fig. 1, on left) and the number of banked turns it could make during aerial combat (Fig. 1, on right) depending on flight altitude and speed.

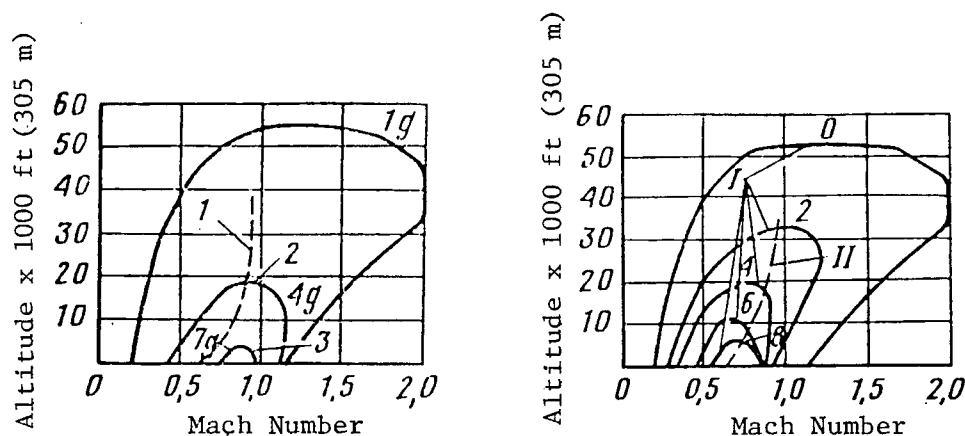


Fig. 1. Tactical capabilities of a typical fighter of the 1960's-1970's with full payload and a 50-percent fuel reserve

- |   |  |
|---|--|
| <p>On left:</p> <ol style="list-style-type: none"> <li>1. Speed of maximum flight range</li> <li>2. Area of maneuvering with average g's</li> <li>3. Area of maneuvering with high g's</li> </ol> | <p>On right:</p> <ol style="list-style-type: none"> <li>I. Number of turns fighter can make during aerial combat</li> <li>II. Speed of maximum flight range</li> </ol> |
|---|--|

It follows from the first chart that maneuvering with maximum g's is not a stable regime at supersonic speeds and, from the second chart, that a larger number of turns, regarded as a unique "yardstick" of an aircraft's capability to conduct aerial combat, can be performed at subsonic speeds near cruising speed inasmuch as the aircraft's engines are optimized for such conditions. This confirms once again that an aircraft has sufficient tactical capabilities at a speed of  $M < 1$ .

A strengthening of the position of close maneuverable combat and a study of deficiencies of existing aircraft led to development in the United States of the F-16 light fighter (Fig. 2 [figure not reproduced]), adopted in the air forces of many capitalist countries.

The journal INTERNATIONAL DEFENSE REVIEW wrote that the F-16 is the only representative of new generation aircraft with maximum speed of  $M = 1.6$ , i.e., less than for the F-4 and F-104 fighters. Its service ceiling remained unchanged, but maneuver characteristics were improved substantially chiefly thanks to an increase in the thrust-to-weight ratio (greater than 1) and in values of permissible g's (up to 9 at low altitude). Particular attention was directed to an improvement in flying characteristics in the transonic range of flight speeds, where the greatest turn rate is achieved (to reduce the effect of high g's on the pilot, who is accommodated in a reclining position in the F-16 cockpit). It is also noted that the F-16 fighter is capable of assuming greater pitch angles under controlled flight conditions for faster assumption of the initial position for employing weapons (or to evade an enemy attack).

The first test of F-16 fighters under actual conditions occurred in June 1982, when they took part in aerial combat over Lebanon as part of the Israeli Air Force.

Judging from western press reports, the APG-66 airborne radar installed in the aircraft and the entire weapon control system demonstrated rather high reliability and accuracy in firing the gun and launching the Sidewinder guided missiles. But the aircraft actually has no equipment for stable detection of airborne targets at night and in adverse weather conditions, or in hitting targets beyond the limits of visual range.

Flight personnel of U.S. Air Force fighter air wings presently train under programs preparing them for maneuverable aerial combat drawn up with consideration of the experience of local wars. Operating tactics of the probable enemy's aircraft are simulated by specially formed squadrons. The programs include a study of standard offensive and defensive techniques which the pilots practice until they are automatic in order to achieve rapid and correct reaction to standard situations in combat. Each technique initially "undergoes" stages of mathematical, half-scale (on a simulator complex) and full-scale modeling (in the process of a flying experiment). The foreign press has reported that in working out new tactics supersonic speeds are used in a limited manner and chiefly only in the phases of closing with or separating from the enemy. In the opinion of foreign experts, this was caused not by the desire to save on operating life or fuel, but by an absence of tactical expediency for using threshold flying conditions both in speed and altitude.

The factor of maneuverability within the framework of close aerial combat is linked closely with the weapons factor, the capabilities of which are the basis for the second element of the traditional "maneuver-fire" system. The western press notes that weapons of third generation fighters have been improved considerably. In particular, the AIM-9L missile no longer has major restrictions on minimum launch range (it has been reduced to 300 m) and on the platform's g's at the moment of launch (increased to 6). There also has been an increase in sensitivity of the homing head and in its angular deviation (it can lock onto a target within limits of a  $28^\circ$  angle and track it within limits of an angle up to  $40^\circ$ ). As a result of this even attacks from the forward hemisphere at a three-quarter target aspect have become realistic at the present time, while previously, when the first models of the Sidewinder guided missile were used, it was necessary to place the aircraft almost on the tail of a maneuvering enemy, squeezing everything possible out of one's aircraft and often entering the area of maximum permissible g's.

But flight tests showed that conditions for launching the AIM-9L missile at large target angles against an enemy in a turn are extremely rigid. It is necessary to close to short range which allows the target to be locked on by the missile homing head, if only for a short time. The "lock-on--launch--disengagement" process lasts a matter of seconds, and not every pilot can cope with that task, particularly in actual aerial combat.

The American journal FLIGHT wrote on this score that an expansion of the area of possible attacks theoretically permits a target to be hit almost on head-on courses, but fighters have not yet reached the all-aspect close combat, although the ratio between maneuver and fire has changed in favor of the latter. A widening of the zone for employing short-range weapons presents greater freedom for maneuver in an attack and greatly hinders defensive actions. And so the problem of improving the fighter's maneuver characteristics remains urgent and the squaring of the unit wingload (G/S) in the formula of an aircraft's capability to perform aerial combat also justifies itself at the present time.

Although, as the western military press emphasizes, the F-16 fully meets initial project requirements formulated for a future daytime aerial combat fighter, air forces of the United States, Belgium, the Netherlands, Denmark and Norway insist that it be additionally armed with the new AMRAAM all-weather guided missiles, which do not require guidance after launch and which are employed from a range exceeding visual range (the AMRAAM missile is being developed under an accelerated competitive program by the American firms of Hughes and Raytheon, while Westinghouse received an order for modernizing the F-16's airborne radar).

The DECELERATION (BRAKING--T) FACTOR. In analyzing the experience of combat among second generation jet fighters in local wars, the journal FLUG REVUE defined the tasks of opponents in each of the phases of maneuverable aerial combat as follows: 1. Assure superiority over the enemy in thrust before closing with him or attain a higher energy level from reserve speed; 2. Use of this advantage to take up a favorable position; 3. Placing one's aircraft in

the area of possible attacks on a target with consideration of the possibility of the deceleration needed to guide weapons; 4. "Provoking" the enemy to pursue in case the attack fails, with a subsequent seizure of the initiative by abrupt deceleration and restoration of a favorable position. Thus deceleration (braking) is given more than a minor role to play in maneuverable aerial combat. There has to be a rapid transition to negative acceleration both in an attack (to support aiming and conducting fire), and on the defense (to seize the initiative).

As an element of combat tactics, deceleration is practiced by flight personnel during training flights when they go through combat training programs. The defensive maneuver with the somewhat uncommon name of "high g-roll" has been familiar since World War II times. This is a delayed spatial roll made with a large (high) overload (g) and a slip. The aircraft shifts in airspace along three coordinate axes simultaneously, which hinders the aiming of an enemy who has moved into an area of possible attack from the rear hemisphere. The sudden beginning of this maneuver, accompanied by an abrupt decrease in speed (deceleration), leads to the attacker's "overshooting" if he is late in responding. The attacker thus moves ahead against his will and ends up in a defender's position.

The technique is considered risky inasmuch as a loss of speed in aerial combat always costs a pilot very dearly since it deprives him of offensive potential. But when an enemy enters an area of possible attack, the choice of tactical moves is reduced to a minimum, and those remaining entail risk. The simplest of them to execute is the "break" maneuver (the term was taken from boxing jargon, where it signifies the forcible separation of opponents), which also involves deceleration, but here it is undertaken to achieve maximum possible turn rate, with the previous goal of taking the enemy out of the area of possible attack. To do this the pilot creates an overload exceeding the maximum permissible for thrust, and here he deliberately decelerates to achieve a distortion of the flight path which the enemy cannot repeat. As a result the latter "is carried" to the outside of the turn and use of his weapons is precluded.

But the foreign press notes that the premature beginning of defensive maneuver when there is still a great distance to the attacker does not produce the desired effect, since the enemy will be able to continue the pursuit and attack of the target. Foreign military specialists again began talking about techniques involving the use of deceleration, which had been about to fade into the past, after the Anglo-Argentine armed conflict of 1982, during which deceleration as a tactical element again was used widely and had a direct influence on the results of aerial combat.

The western press notes that aerial combat over the Falkland (Malvinas) Islands was characterized by the fact that British Harrier and Sea Harrier VTOL aircraft took part in them for the first time. According to British press reports the Harrier aircraft shot down 19 Argentine Mirage-3 and Dagger fighters without suffering any losses. Foreign military experts believe that this result places one on guard not only from the standpoint of quantitative indicators, but also from the position of the theory and practice of aerial

combat between different types of aircraft of the same generation. They stressed that the Harrier fighters have the capability of changing thrust vector and subsonic flight speed (up to 1,160 km/hr), while the enemy Mirage-3 and Dagger fighters are incapable of doing this, but their maximum flight speed is two times more. The aircraft armament is approximately identical (each has two Sidewinder guided missiles and two 20-mm cannon).

In accordance with what was said above, foreign specialists believe that two factors had a decisive influence on the outcome of aerial combat: maneuverability and tactics. They view the latter only in close combination with equipment capabilities, particularly the capability of Harrier aircraft to turn about their vertical axis by changing the thrust vector, thus rapidly decreasing translational velocity (abrupt deceleration).

The capabilities of VTOL aircraft to conduct maneuverable aerial combat have been studied abroad from the very beginning of their development. Flight experiments were performed for this purpose in addition to theoretical calculations and simulation. In particular, according to the journal FLUG REVUE, military specialists of Great Britain, the United States and the FRG performed a series of flights of the Kestrel aircraft, which is the prototype of the Harrier fighter, for aerial combat against a T-38 supersonic trainer with a flight performance similar to the data of combat fighters of the 1960's and 1970's. Theoretical premises for this experiment were as follows.

Western experts believed that superiority in aerial combat is determined by anticipation in taking up an initial attack position. The standard trajectory reflecting mean data on aircraft movement represents a descending spiral, since the overwhelming number of fights will occur when maneuvering in the horizontal plane and a gradual forced reduction in altitude is the result of employing uncoordinated turns with a loss of speed. Pilots lose altitude while trying to restore the aircraft's lost energy level by descending (diving). The capability of performing a turn in any plane with a lesser radius and greater turn rate will permit a pilot to dictate the conditions of combat to the enemy.

Simulation results showed that when flying in a spiral the aircraft capable of changing horizontal speed abruptly receives an advantage in position. That aircraft enters the area of possible attack faster and evades enemy fire. With a sufficient duration of flight and the presence of appropriate weapons this will be the VTOL aircraft. It is believed that in a struggle for air superiority it will concede nothing to high-speed fighters, while the latter also will be deprived of a number of advantages given them by the equipment: high rate of climb, short acceleration time, small unit wing load and so on.

Flight tests confirmed these propositions. In particular, when the Kestrel and T-38 aircraft began moving in a spiral with an initial velocity of  $M=1$  an altitude of 1,650 m (the chart of their flight paths is shown in Fig. 3), the Kestrel pilot created conditions for himself for launching the Sidewinder missiles or firing guns against the T-38 in the very first turn of the spiral.



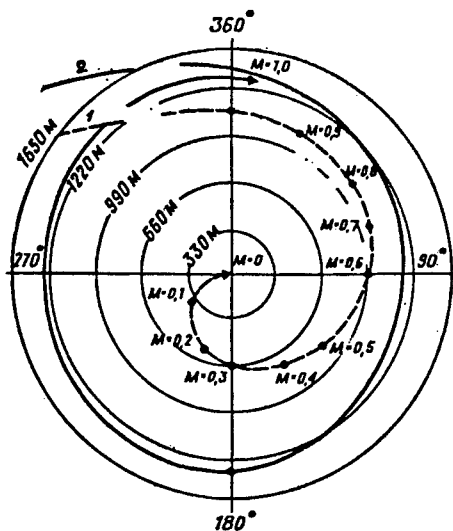


Fig. 1. Chart of aircraft flight paths:

1. Kestrel VTOL
2. T-38 supersonic trainer

Foreign military specialists believe that in encountering the Argentine Mirage-3 and Dagger aircraft, British Harrier fighter pilots formed their tactics with consideration of the above theses about the advantages of VTOL aircraft over high-speed aircraft. In addition, their tactics counted on the behavior of an enemy adapted to standard combat with conventional fighters and, as the results of combat show, they succeeded in this to the full extent. In the opinion of certain western experts, however, the fact should not be forgotten that the British aircraft were armed with more advanced Sidewinder AIM-9L guided missiles than were the Argentine aircraft.

The INVULNERABILITY FACTOR. Foreign experts take it to mean strictly the aircraft's invulnerability (N), determined by the extent of its armor protection, strength of components and parts, redundancy of systems, aircraft dimensions (Cr) and its other design features, as well as the effectiveness of self-protection

equipment. In their opinion this factor gained even greater importance in connection with the development of airborne weapons and aircraft electronics. A maneuver which took the attacker out of the limits of an area of possible weapon employment previously was considered the most reliable means of defense, but as guided missiles were perfected these areas expanded considerably and maneuver ceased to guarantee a high likelihood of evasion even with prompt detection of the enemy.

An increase in invulnerability began to be connected more with use of individual means of protection by the aircraft, and above all airborne electronic countermeasures [ECM] systems, with which third generation fighters are equipped. In particular, the ALQ-131 automated active jamming pod has been installed in the aforementioned F-16 intended for conducting aerial combat. In the opinion of foreign specialists, the pod meets all demands placed on electronic warfare [EW] systems of the 1980's: versatility, complete autonomy, modular design elements, and adjustment of transmitter output and control using a digital EVM [electronic computer]. The foreign press notes, however, that flight-testing showed that the external suspension of pods with the EW gear deteriorates an aircraft's flight performance and as a result its capabilities for conducting maneuverable aerial combat are degraded. Therefore a similar station (the ALQ-135) in the F-15 fighter is installed inside the fuselage.

In addition to such sets of equipment, third generation fighters are being fitted with systems warning the pilot of radar illumination, devices for dispensing chaff and infrared decoys, and other gear. In the estimate of foreign specialists, all this will permit a significant improvement in aircraft invulnerability in aerial combat and when performing other missions.

On the whole, western military experts believe that the importance of electronics has increased in particular as a result of changes which occurred after the appearance of jet aircraft and guided missiles of the third generation. Without obtaining data on the air enemy at a great distance and in real time it is impossible to correctly distribute fighter forces, commit them promptly and make effective use of new medium-range guided weapons. At the same time the factors of weapons, maneuverability and invulnerability remain in their places in the formula with consideration of the change in their content, i.e., in the fourth, second and first powers respectively, and that is just how they influence the tactics of modern fighters.

NATO military experts are pursuing two propaganda objectives in discussing the issues examined above and other issues in the press, in addition to the attempts to identify actual capabilities of modern fighters in aerial combat from a practical science point of view. First of all, in giving a positive assessment to existing combat equipment they are attempting to justify the enormous expenditures connected with its development. Secondly, by placing a "but" in places, i.e., by taking note of certain deficiencies of the aircraft and their airborne weaponry, they are striving to impress on readers the idea of the need to develop more advanced (and naturally more costly!) models. In so doing they quite often hint, and even more often openly refer to their concocted "Soviet military threat," thus attempting to justify the unprecedented arms race and preparation for war against the USSR and other countries of the socialist community unleashed by the United States and its allies in the aggressive imperialist NATO bloc.

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## FOREIGN MILITARY AFFAIRS

### METHODS FOR LAUNCHING PENGUIN-3 MISSILES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 59-63

[Article by N. Novik, candidate of technical sciences; passages rendered in all capital letters printed in boldface in source]

[Text] Judging from foreign press reports, many developed capitalist countries are performing intensive work for further improvement of air-to-ship antiship missiles (PKR's). Western military specialists are carefully studying the experience of employing such missiles in local wars and are seeking ways to improve their practical flight characteristics and tactical effectiveness. For example, when new weapons are being developed in Great Britain, Norway, Italy, France, Israel and a number of other states consideration is given to results of the Anglo-Argentine conflict during which both the merits and deficiencies of the present generation of antiship missiles were demonstrated.

Armed forces of NATO countries presently have the Exocet, Cormoran, Harpoon and certain other antiship missiles with active radar homing heads (GSN's). Foreign specialists believe that they can be used effectively only against single surface targets on the high seas. They back up this thesis by saying that during the Anglo-Argentine conflict the Argentine Air Force command decided not to use the remaining unit of fire of Exocet antiship missiles to repulse the British amphibious landing in the vicinity of the port of San Carlos since the homing heads of these missiles would not provide accurate target selection against the background of the very rugged coastline and thus would not be able to effectively hit ships located near the coast.

In addition, by virtue of the impossibility of launching the Exocet antiship missile against targets close to the attack aircraft with the aircraft's simultaneous concealment in folds of the terrain, Argentine pilots were not able to employ them to attack enemy ships in the narrow Falkland Sound.

In accordance with what was presented above, the Norwegian firm of Kongsberg Vapenfabrikk (jointly with the defense ministry's scientific research institute) is performing work to develop the Penguin-3 antiship missile, which is to become operational in late 1987 with the F-16 Fighting Falcon fighter-bombers of the Norwegian Air Force. Each of these aircraft will be able to

carry four such missiles or two missiles and two suspended 1,400 liter fuel tanks on underwing pylons.

Basic estimated combat characteristics of the Penguin-3 missile and methods of launching it from the F-16 Fighting Falcon fighter-bomber are given below from data published in the foreign press.

The Penguin-3 antiship missile is being developed on the basis of the Penguin-2 ship-to-ship missile especially for coastal defense and for attacking enemy ships in coastal waters from the air.

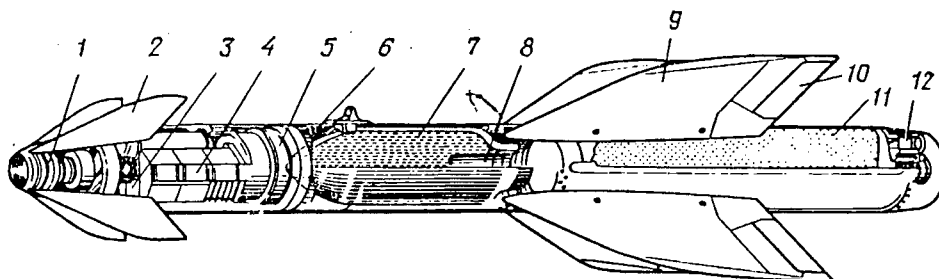


Fig. 1. Design of Penguin-3 antiship missile:

1. Homing head
2. Cruciform control surfaces
3. Radio altimeter
4. Autopilot and gyroscopic servodrives of control surfaces
5. Inertial navigation system platform
6. Power source
7. Warhead
8. Fuze
9. Cruciform wing
10. Ailerons
11. Solid-fuel rocket motor
12. Safety and actuating mechanism

The missile body has an aerodynamic canard shape and modular design consisting of three compartments (Fig. 1). The nose compartment contains an autonomous, jamming-resistant infrared homing head, radio altimeter, autopilot and gyroscopic servodrives of the control surfaces, an inertial navigation system platform on a gimbal suspension with one degree of freedom in bank, an airborne EVM [electronic computer], and a power source.

The central compartment contains the warhead and delay impact fuze, and the tail compartment contains a single-chamber solid fuel rocket motor with low-smoke exhaust and a safety and actuating mechanism. A cruciform wing with ailerons is attached to the compartment surface.

Judging from data published in the foreign press, the Penguin-3 missile will have the following basic combat characteristics: a launch weight of 350 kg

(a warhead of 120 kg), a length of 3.2 m, wingspan of 1.0 m, body diameter of 0.28 m, a range of fire of from 5 to 40 km, a cruising speed of 270 m/sec, launch altitude range of 45-9,000 m, and a maximum permissible overload of 10 g when maneuvering along the path (with a flight speed of  $M = 0.7$ ). The maximum flying altitude of the F-16 with Penguin-3 missiles is 12 km, and its speed must not exceed  $M = 1.2$ . Depending on the target's position the anti-ship missile can change flight direction after launch under a given program from 0 to 90° (and sometimes more).

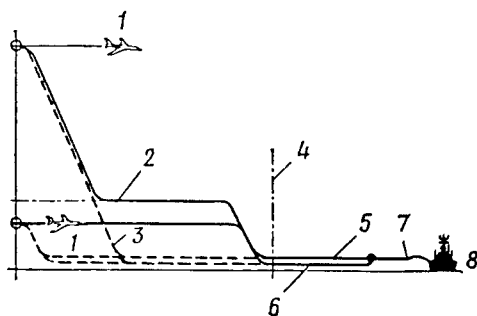


Fig. 2. Missile flight path profiles (in the vertical plane) when launched from high and low altitudes:

1. Airborne platform
- 2 and 3. Maximum and minimum cruising altitudes
4. Point (line) of termination of missile descent to low (5) or extremely low (6) altitude
7. Increase in altitude after turning on homing head
8. Target

Vertical profiles of its flight path are shown in Fig. 2. After launch from the platform the missile descends to a preselected maximum or minimum cruising altitude controlled by the radio altimeter, during which time it is guided to the target by the inertial navigation system. On reaching a programmed distance to the target the missile shifts to low or extremely low altitude. Then flight altitude automatically increases after the homing head is turned on for improving conditions for target search and lock-on.

As the western press emphasizes, the missile guidance system and F-16 airborne equipment will permit attacking targets using several tactics which hinder the enemy in organizing antimissile defense of ships and which reduce the likelihood of the airborne platform being destroyed.

Based on the nature of the strike objective and the situation in its vicinity, the pilot can select a combination of parameters before take-off or in flight along the route by pressing appropriate buttons on the control panel, which has a memory device and is coupled with the airborne weapon control system.

The parameters are as follows: missile launch mode; vertical profile of its flight path; width of homing head scanning pattern; number of targets against which the homing head must not function initially in attacking a group of ships (from one to five); activation (if necessary) of the airborne EW device; and choice of a single or volley mode of fire. Several seconds before launch the pilot performs a target designation, sets the point at which the missile shifts to extremely low flight altitude, and checks the readiness of its airborne systems. A launch can be performed from the F-16 fighter-bomber by three basic methods.

The FIRST METHOD (based on data of the aircraft's airborne radar) is used when the enemy is not using ECM or is performing jamming which can be countered effectively. In this instance (Fig. 3) the pilot uses the radar to view the zone of the enemy's likely location, selects a target, determines its

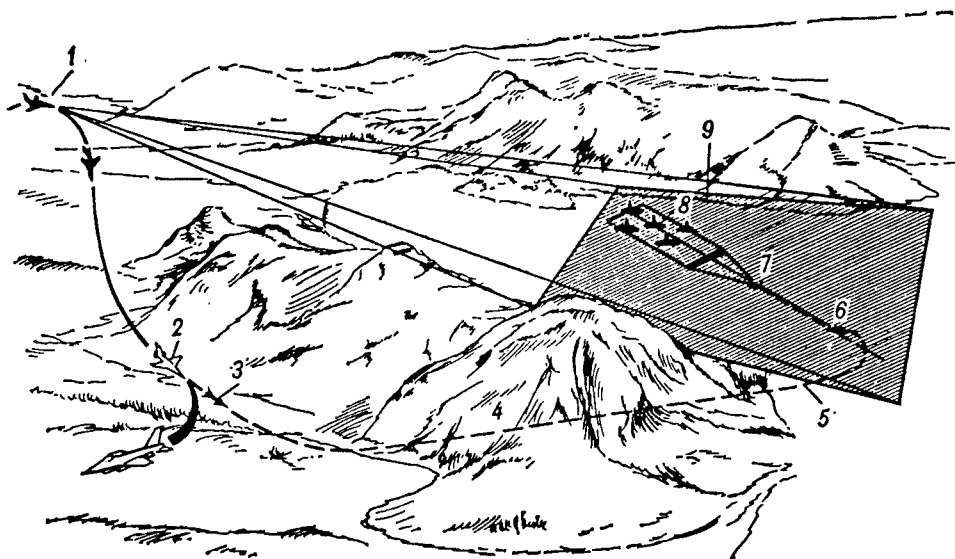


Fig. 3. Missile launch based on airborne radar data:

1. Airborne platform
2. Point of missile launch and departure from target
3. Autonomous missile flight
4. Maintaining given cruising altitude over terrain
5. Beginning of missile turn to target
6. Missile's assumption of combat course and of low or extremely low altitude
7. Beginning of homing head's target search
8. Target
9. Zone of probable enemy location viewed by airborne platform's radar during search for strike objective and aiming

coordinates and the point of missile descent, and inputs all necessary data into the airborne weapon control system (after this the automatic equipment continuously computes the airborne platform's coordinates relative to the target). After performing these operations the pilot can change the aircraft's flight path with a deviation of up to  $50^\circ$  from the initial line of sight to the target, perform tracking and, using terrain relief for concealment, launch the missile from a region shielded from the enemy, such as from behind an elevation. At the moment of launch the missile's coordinates relative to the target and the flight program are placed into the missile control system. The missile flies further based on commands produced by this system. In particular, a given cruising speed is maintained when flying over the ground and a descent in the path begins after arriving at the coastline. The antiship missile turns in the direction of the target and, after reaching a programmed point above the water's surface, it decreases flight altitude to one of two values selected before the launch. At a given distance from the target the infrared homing head automatically turns on and begins the search for and guidance to the target.

Judging from reports of the journal INTERAVIA the infrared homing head of the Penguin-3 antiship missile has a short operating range and a relatively narrow scanning pattern, determined by the fact that the missile's inertial navigation system provides a rather precise vectoring to the vicinity of the strike objective. The pilot can choose one of three values for the homing head scanning pattern width, and specifically: minimum, medium and maximum. The first is set for increasing the head's selectivity and when launching a missile against a nearby target, the second when the strike objective is at medium range, and the third when launching the antiship missile at maximum or near maximum range of fire.

In addition, the choice of a homing head with a narrow scanning pattern is determined by the fact that the antiship missiles are intended for delivering a strike not so much against individual ships as against groups of ships. In this case the missiles must have rather high selectivity. With regard for this selectivity, the Penguin-3 antiship missile guidance system includes a special program permitting it not to be aimed against the first individual targets it detects in the vicinity of the strike objective (one to five, with their number set by the pilot on the control panel before missile launch). In the opinion of Norwegian specialists, this will permit the missiles not to function against dummy targets and enemy ships already hit but remaining afloat, or against several escort ships which have entered the scanning zone, and it will permit hitting the most important target located in the center of the order.

To overcome the antimissile defense of a ship or group, the launch of the Penguin-3 missile can be accomplished as a volley and the missiles can approach the target from different directions. In the opinion of western military experts, use of this tactic will increase the likelihood of hitting enemy ships.

The SECOND METHOD for launching the missile (using an optical sight--its role in the F-16 fighter-bomber is performed by a head-up display) will be employed when the enemy performs effective jamming of the aircraft's airborne radar. It has three different versions for sighting and delivering a strike: triangulation with the missile's straight flight to the target, and ordinary sighting with the missile executing a left or right turn.

In the first version (Fig. 4) the airborne platform pilot makes the first visual target designation by laying the line of sight on the target and lining up the missile mark on the semitransparent display surface with the line. Parameters of the line of sight (relative bearing and angular altitude) are input to the memory of the airborne weapon control system EVM and the approximate position of the first point where the missile is to assume low (or extremely low) flight altitude is computed.

Then the pilot maneuvers and gets on the combat course from another direction, makes another target designation, and the EVM calculates (by the triangulation method) the distance to target, a more precise location of the point where the missile is to assume low (or extremely low) altitude, the direction of the missile's flight to the target and other data. All information is input to

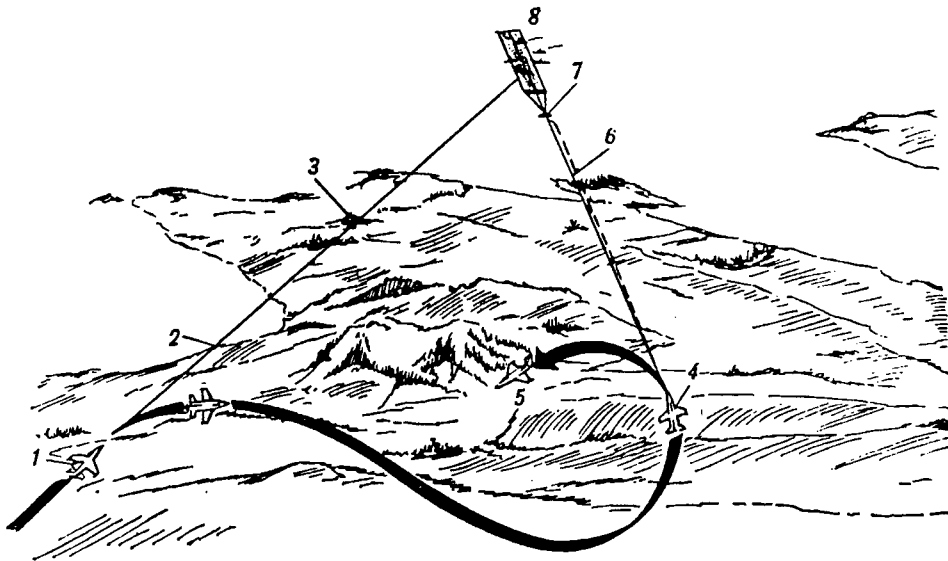


Fig. 4. Missile launch using head-up display:

1. Airborne platform
2. First sighting line
3. First reference point for beginning of missile descent
4. Sighting from another direction and missile launch
5. Aircraft's departure from combat course
6. Second sighting line
7. Second reference point for missile's assumption of low or extremely low flight altitude
8. Target

the missile's inertial navigation system computer and the pilot can launch it immediately or after an additional course maneuver with a turn up to  $50^\circ$ .

In the second sighting version (Fig. 5) the pilot performs one target designation. After the relative bearing and distance to target (the latter is determined from the angle of inclination of the line of sight and aircraft's flight altitude relative to sea level) have been input to the missile's airborne EVM, the pilot makes a right turn, using terrain relief for concealment, places the aircraft in the most advantageous zone for launching the missile and after launching it departs from the target.

The missile initially maintains launch altitude, then descends (under a given program) and makes a left turn to the target. At a reference point it shifts to low or extremely low flight altitude. The homing head is turned on at a certain distance from the attack objective and begins the search for and guidance to the target.

In the third version of sighting the pilot proceeds in the same manner as in the previous instance, the only difference being that the aircraft turns left and the missile makes a right turn while descending to a given altitude.

The THIRD METHOD of launch (manual mode). The pilot directs the aircraft toward the target and sights using a special mark illuminated on the



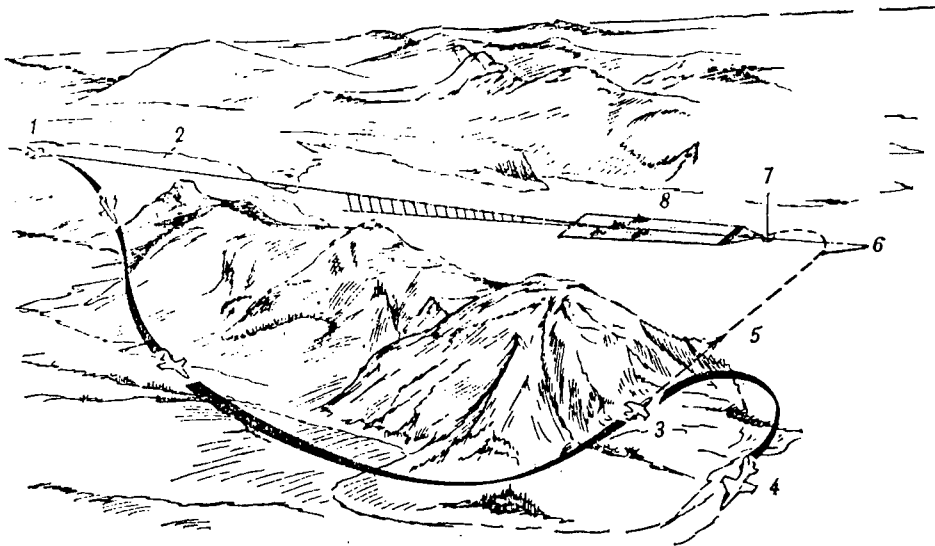


Fig. 5. Missile launch using head-up display with a missile left turn:

1. Airborne platform at the end of target designation
2. Line of sight to target
3. Missile launch point
4. Aircraft departure
5. Leg of missile flight path to the point for beginning turn
6. Point for beginning missile descent and turn toward target
7. Missile's assumption of given altitude and combat course and activation of homing head
8. Target

semitransparent display surface, and launches the missile. After this the missile immediately descends and flies in the direction of the attack objective. At a given distance the homing head is activated and begins the search for and guidance to the target.

The western press reported that tests of models of the F-16 aircraft and Penguin-3 antiship missile in a wind tunnel (performed in 1981) showed that the missile can separate from the aircraft safely under conditions of a normal launch and an emergency release. Work began in late 1982 to couple missile systems with the F-16 fighter-bomber's airborne electronics, and in 1983 flight testing began of the F-16 with a model of the Penguin-3 antiship missile at the American Edwards Air Force Base (in California). The plans are to complete evaluation testing of the missile in the spring of 1986, and troop testing in 1987.

The firm of Kongsberg Vapenfabrikk and the Norwegian ministry of defense plan to arm other types of flying craft in the future, particularly helicopters, with the Penguin-3 antiship missiles and to equip it with a thermal imaging or laser homing head, a more effective warhead and an improved fuze.

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## FOREIGN MILITARY AFFAIRS

### FRENCH MIRAGE AIRCRAFT DESCRIBED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 64-69

[Article by Engr-Lt Col P. Ivanov under the rubric: "At the Readers' Request"; passages rendered in all capital letters printed in boldface in source]

[Text] Our journal's readers S. Merenkov, A. Savel'yev, V. Sosnitskiy and many others ask us to tell about the French Mirage aircraft. We are fulfilling their request.

French ruling circles each year considerably increase appropriations for the manufacture of aviation equipment both for the French Air Force and for export to many countries as they draw their Armed Forces more and more into military measures of the NATO bloc and constantly step up the arms race.

Mirage type warplanes of different versions and modifications have been developed and are being manufactured by Dassault-Breguet, one of the largest aircraft construction firms in France. The firm was formed in December 1971 from the merger of two previously independently existing firms of Avions Marcel Dassault and Breguet Aviation. Dassault-Breguet presently unites 18 separate plants at which varied products are manufactured, chiefly warplanes. Information is given below taken from foreign press articles about Mirage type aircraft of different variants and modifications which are most widespread in air forces of foreign countries (their basic characteristics are given in the table).

The MIRAGE-3 was developed in the latter half of the 1950's, with its experimental prototype making the first flight in November 1956. The aircraft was produced in several versions, with the primary ones presently being: the Mirage-3E tactical fighter, Mirage-3C fighter-interceptor, Mirage-3R reconnaissance aircraft and Mirage-3D operational trainer.

The MIRAGE-3E TACTICAL FIGHTER (see color insert [color insert not reproduced]) was developed in 1961, with deliveries to French Air Force line units beginning in 1964. The western press indicates that a total of some 530 such aircraft were built and they are in the inventory of the air forces of 13 countries, including Argentina, the ARE [Arab Republic of Egypt], Australia,

Basic Combat Characteristics of Mirage Aircraft

Aircraft Designation	Crew	Weight, kg:	Maximum Speed (at 11,000 m), km/hr	Combat Radius, km	Aircraft Length x Height x Wingspan, m Wing Area, m <sup>2</sup>
		Maximum Takeoff Empty	Service Ceiling, m		
Mirage-3E	1	13 500	2350	1200	15.03 × 4.5 × 8.22
		7050	16 000		35
Mirage-5	1	13 700	2350	1300	15.55 × 4.5 × 8.22
		6600	17 000		35
Mirage-50	1	13 700	2350	630 <sup>1</sup>	15.6 × 4.5 × 8.22
		7150	18 000		35
Mirage-F.1C	1	15 200	2350	3300 <sup>2</sup>	15.25 × 4.5 × 8.44
		7900	16 500		25
Mirage-3NG	1	14 700	2350	.	15.09 × 4.5 × 8.22
		.	20 000		35.9
Mirage-2000	1	16 500	2450	1200	14.4 × 5.3 × 9.15
		7400	18 000		45
Mirage-4000	1	28 000	2450	Over 2000	18.7 × . × 12
		13 000	20 000		73
Mirage-4A	2	33 800	2350	4850 <sup>3</sup>	23.23 × 5.42 × 11.85
		14 500	16 500		78

1. At low-altitude flight with two 400-kg bombs.
2. Flight range with maximum fuel reserve.
3. Flight range with suspended fuel tanks.

Brazil, Spain, Pakistan, YuAR [Republic of South Africa] and Switzerland. It is designed in a tailless configuration with a low-set delta wing having a sweepback on the leading edge of around 61°. The wing is fitted with ailerons controlled with the help of hydraulic drives. Airbrake flaps are located on the upper and lower wing surfaces. There is a tricycle landing gear with air pressure in the main-wheel tires of 6-10 kg/cm<sup>2</sup>. There is a braking parachute on the aircraft to reduce the length of the landing run. The power plant consists of one Atar 9C TRDF [turbojet engine with afterburner] with a thrust of 6,200 kg during boost. The engine air intakes are laterally placed and controllable. To improve acceleration characteristics the fighter can be fitted with a suspended rocket booster accommodated beneath the fuselage and developing a thrust of 1,500 kg. The total capacity of the aircraft's internal fuel tanks is 3,000 liters. In addition, two jettisonable fuel tanks, each of 625, 1,100, 1,300 or 1,700 liters, or two 500 liter nonjettisonable tanks designed for supersonic flight speeds, can be suspended beneath the wing.

A Martin-Baker RM4 ejection seat is installed in the fighter which allows the pilot to leave the aircraft on the ground at a speed of around 170 km/hr. Two independent hydraulic systems operating at a pressure of 210 kg/cm<sup>2</sup> provide for operation of aircraft controls, landing gear and brakes. The dc power sources are a storage battery and a 26.5 volt dc generator. A transformer and one

10 kilovolt-amp generator produce 200 volt 400 Hz alternating current. The basic electronic components include a UHF communications radio, TACAN radio navigation system gear, Doppler meter for ground speed and drift, Cyrano-2 fire control radar, navigation EVM [electronic computer], bombing computer and automatic gunsight. The airborne radar is used primarily for detecting airborne targets, but it also can serve for observing the earth's surface, thus making it easier to solve navigational problems.

The fighter's built-in weapons consist of two DEFA 30-mm cannon (each with a unit of fire of 125 rounds) located in the fuselage. They are used to hit both ground and airborne targets. Two 1,000 pound bombs or two bombs and one AS-30 air-to-surface guided missile (beneath the fuselage) ordinarily are suspended beneath the wings for delivering attacks against ground targets. According to foreign press reports, 30 Mirage-3E fighters of the French Air Force are platforms for AN-52 15 KT tactical nuclear bombs. To hit airborne targets the aircraft can carry one Matra R.530 medium-range guided missile (beneath the fuselage) and two Sidewinder short-range aerial combat missiles (beneath the wings).

The MIRAGE-3C FIGHTER-INTERCEPTOR was developed in 1960. A total of more than 240 aircraft were produced, of which 72 were supplied to the Israeli Air Force (with the designation Mirage-3CJ) and 16 to the Republic of South Africa Air Force (Mirage-3CZ). The fighter is fitted with the Atar-9B engine with a thrust of 6,000 kg. Basic weapons include one Matra R.530 guided missile (suspended beneath the fuselage) and two Sidewinder guided missiles (beneath the wings), with two built-in DEFA 30-mm cannon. According to French press reports the aircraft also can be used as an attack aircraft, in which case it carries two 1,000 pound bombs or one AS-30 air-to-surface guided missile (beneath the fuselage) and bombs or launchers with free-flight rockets (beneath the wings).

The MIRAGE-3R RECONNAISSANCE AIRCRAFT was developed in late 1961 based on the Mirage-3E fighter. Its basic reconnaissance equipment includes five Omera Type 31 aerial cameras (AFA's) accommodated in the nose portion of the fuselage in place of the airborne radar. These cameras can be installed in one of four versions, providing for photo reconnaissance from low, medium and high altitudes as well as at night. A total of some 160 Mirage-3R aircraft (including the Mirage-3R2Z and Mirage-3RD) was ordered for the air forces of nine foreign countries. Aircraft of the first modification were fitted with the Atar-9K50 engine and were supplied to the Republic of South Africa Air Force during 1974-1975.

The Mirage-3RD basically is similar to the Mirage-3R, but it has an improved Doppler navigation system, gyro stabilized optical gunsight, and Omera Type 40 and 33 cameras in the nose. Such aircraft are in the order of battle of Pakistan's Air Force (the composition of airborne electronics was changed) and the French Air Force.

The MIRAGE-3D OPERATIONAL TRAINER was manufactured in Australia in addition to France. It differs from the fighter primarily by the two-seat cockpit and absence of an airborne radar. In addition to training purposes, it can be used for delivering strikes against ground targets. A total of some 185 aircraft of this type was built and sold to approximately 20 countries.

The MIRAGE-5 was developed in 1967 on the basis of the Mirage-3E (identical airframe and power plant), but it has simpler electronics, 470 liters more capacity of internal fuel tanks, and substantially greater payload. The Mirage-5's primary purpose is to deliver strikes against ground targets, for which it can carry a payload of up to 4,000 kg on six wing attachment points and one fuselage attachment point. In accomplishing missions of intercepting airborne targets the Mirage-5 fighter is fitted with two Magic R.550 or Sidewinder air-to-air guided missiles and three suspended fuel tanks with a total capacity of 4,700 liters (two 1,700 liter tanks and one 1,300 liter tank). The aircraft's built-in armament consists of two DEFA 30-mm cannon with a total unit of fire of 250 rounds.

The Mirage-5's electronics, installed at the desire of the customer, can include an inertial navigation system, a sighting-navigation system with electro-optical display and an Agave multirole radar or laser rangefinder-target designator and the Aida-2 radar. As of February 1984 around 440 Mirage-5 aircraft including the reconnaissance (Mirage-5R) and trainer (Mirage-5D) versions had been ordered for the air forces of 12 countries.

The MIRAGE-50 (Fig. 1 [figure not reproduced]) has an identical airframe to the Mirage-3 and Mirage-5, but is fitted with the more powerful Atar-9K50 engine (with a thrust of 7,300 kg with afterburner). The prototype made its first flight in the spring of 1979. The Mirage-50 is a multirole fighter intended for air superiority missions, accomplishing air defense missions and delivering strikes against ground targets. All types of weapons of the Mirage-3 and Mirage-5 fighters can be suspended on it. The Agave or Cyrano radars and an inertial sighting-navigation system are the basic electronic components. The foreign press notes the following advantages of this aircraft over the Mirage-3 and Mirage-5 fighters: shorter take-off distance, increased payload (fuel and weapons), higher rate of climb, and improved acceleration and maneuver characteristics. The fuel reserve in the internal tanks is 3,475 liters. In addition, the Mirage-50 can carry up to three drop-tanks (two beneath the wing and one beneath the fuselage) with a total capacity of 4,700 liters.

The MIRAGE-F1 was developed in the latter half of the 1960's and has been in series production since 1973. There are several versions: the Mirage-F1C, an all-weather tactical fighter; the Mirage-F1B, a two-seat operational trainer (it began to be delivered to French Air Force units in 1980); the Mirage-F1E, a tactical fighter intended for export to other countries; and the Mirage-F1CR, a reconnaissance aircraft.

The MIRAGE-F1C TACTICAL FIGHTER (Fig. 2 [figure not reproduced]) has a tapered shoulder-wing with a sweepback of  $47.5^\circ$  on the leading edge. The high-lift devices include leading-edge slats, differentially-operating, two-section, double-slotted flaps, ailerons, and two-section spoilers (located on the upper wing surface ahead of the flaps). The fuselage is of a semi-monocoque design. Airbrakes are located below on the forward parts of the engine air intakes. The tail unit consists of a vertical keel with rudder and horizontal stabilizer with fully deflecting surfaces. The aircraft's directional stability is improved thanks to two additional vertical fins beneath the tail section of

the fuselage. Air pressure in main-wheel tires is 9.1-11.2 kg/cm<sup>2</sup>. A brake parachute is located in the base of the rudder.

The power plant consists of one Atar-9K50 TRDF with a maximum thrust of 7,300 kg with afterburning. Fuel is accommodated in fuselage and wing tanks with a total capacity of 4,260 liters. The foreign press reports that these tanks can be filled in approximately 6 minutes when using a centralized pressure fueling system. To increase flight range up to three auxiliary fuel tanks (one beneath the fuselage and two under the wing) each with a capacity of 1,200 liters can be suspended on the fighter. It is possible to install a nonretractable fuel receiver of the aerial refueling system on the right side of the aircraft's nose portion. Fighters fitted with this system are designated the Mirage-FlC-200. In January 1980 four such aircraft made a six-hour nonstop flight from the island of Corsica to Djibouti with aerial refueling from a KC-135F tanker aircraft. The route was some 5,000 km long.

Two independent hydraulic systems are used for retracting the landing gear and for operating the aircraft controls. The sources of electrical power are two 15 kVA ac generators, with a nickel-cadmium storage battery serving as an emergency source.

The Cyrano IV fire control radar in the nose section of the fuselage is the primary element of the electronic equipment. This set permits accomplishing air defense missions throughout the range of the aircraft's flying altitudes. In addition, in the Mirage-FlE fighter the set permits a determination of range to ground targets and penetration of an air defense system at low altitude in adverse weather conditions. The Mirage-FlC also is equipped with two UHF radios, instrument landing equipment, a TACAN radio navigation system and radar identification system. Included in the equipment used for attacking ground targets is a Doppler radar, bombing computer, aircraft position indicator and laser rangefinder-target designator.

The fighter's built-in armament consists of two DEFA 30-mm cannon with a total unit of fire of 250 rounds. Suspended weapons are accommodated on four attachment points beneath the wings and one beneath the fuselage. In addition, the wingtips each have one station for mounting only air-to-air missiles. The maximum weight of external stores is 4,000 kg. The aircraft can carry one or two Matra R.530 or Super Matra R.530 guided missiles (with radar or infrared homing head) for accomplishing air defense missions. They are suspended under the fuselage and beneath the wings, while the Sidewinder or Magic R.550 guided missiles are suspended on the wingtips. Standard versions of a load for attacking ground targets consist of one Martel AS-37 or AS-30 guided missile, 14 250 kg bombs, four 450 kg bombs, and four launchers, each with 18 free-flight 68 mm rockets. Other versions of external stores include three auxiliary 1,200 liter fuel tanks; one 2,000 liter tank under the fuselage; a pod with laser rangefinder-target designator, the AS-30L air-to-surface guided missile or a guided aerial bomb with laser homing head; and pods with ECM equipment or reconnaissance gear including aerial cameras and an infrared linescan.

The MIRAGE-FlCR RECONNAISSANCE AIRCRAFT. In early 1979 the French Air Force command decided to purchase aircraft of this type to replace the Mirage-3R and Mirage-3-RD. The Mirage-FlCR is equipped with two Omera Type 35 and 40 aerial cameras and an infrared set, installed in the forward part of the fuselage. Additional electronics and optics are accommodated in a suspended pod. Its prototypes made the first flight in November 1981 and in 1982 62 aircraft were ordered for the French Air Force, with plans to make them operational in 1983.

The MIRAGE-FlB OPERATIONAL TRAINER differs from the fighter by the presence of a two-seat cockpit, the absence of built-in cannon, and internal fuel tanks with 450 liters less capacity.

The Mirage-FlA tactical fighter also was manufactured earlier with simplified airborne equipment and an increased fuel reserve. Judging from foreign press reports, production of this aircraft, intended primarily for delivering strikes against ground targets, has been curtailed at the present time.

By early 1983 678 Mirage-Fl aircraft had been ordered, of which 252 were for the French Air Force and 426 were for export to other countries, including Ecuador, Greece, Jordan, Kuwait, Morocco, Qatar, the Republic of South Africa and Spain.

The MIRAGE-3NG TACTICAL FIGHTER is an experimental aircraft of the new generation of the Mirage-3 series and the plans are to supply it for export. Certain technical and industrial solutions used in the Mirage-Fl, Mirage-2000 and Mirage-4000 aircraft were used in developing the fighter. The power plant consists of one Atar-9K50 TRDF. According to French specialists, giving the Mirage-3NG a delta wing with greater sweepback on the leading edge and with forward aerodynamic surfaces improved stability and controllability characteristics, especially when flying at large angles of attack. The fighter's control system is electro-remote. The radio navigation equipment, airborne fire control system and ECM equipment were borrowed from the Mirage-2000 and Mirage-Fl.

The aircraft's built-in armament consists of two DEFA-552 30-mm cannon with a total unit of fire of 250 rounds, and the suspended armament is accommodated on nine external stations (beneath the fuselage and wings). The maximum external payload is 4,000 kg. The Cyrano IV radar is the primary element of the fire control system. Auxiliary 1,300 liter or 1,700 liter fuel tanks can be suspended on the aircraft to increase range and flight duration. One Mirage-3NG had been built by mid-1983 and is presently undergoing evaluation flight testing.

The MIRAGE-2000 FIGHTER (Fig. 3 [figure not reproduced]) is being developed as a next generation warplane. It is planned to be produced in three basic versions: a single-place fighter for accomplishing air defense missions; a single-place tactical fighter for winning air superiority, battlefield interdiction and delivering strikes against ground targets; and the Mirage-2000N two-seat attack aircraft as a platform for the ASMP air-to-surface guided missile with nuclear warhead. In addition, production is planned for the

Mirage-2000B two-seat combat trainer. The first flight of the fighter prototype occurred in March 1978, and later four more prototypes, including one two-seater, were built to conduct flight testing. Series production of the Mirage-2000 aircraft began in 1983.

The fighter is equipped with an electro-remote control system. The power plant consists of one SNECMA M53-5 bypass turbojet engine with a maximum thrust of 9,100 kg with afterburning. Beginning in 1985 the aircraft will be produced with the more powerful M53-P2 engine (a thrust of 9,800 kg). The capacity of internal fuel tanks is 3,800 liters, and two auxiliary 1,700 liter tanks can be accommodated beneath the wings.

The multifunction RDM radar will comprise the basis of the sighting-navigation equipment of the single-seat Mirage-2000 aircraft, and beginning in 1985 it is planned to install in them the more advanced RDI pulse-Doppler set. The Mirage-2000N will be fitted with the Antilope-5 radar, providing a view of the earth's surface in the forward hemisphere and supporting a flight in a terrain-following mode.

The fighter's built-in armament includes two DEFA-554 30-mm cannon with a unit of fire of 125 rounds each. It will be able to carry armament on nine external attachment points (four beneath the wings and five beneath the fuselage) in the following versions: three SuperMatra R.530 air-to-air guided missiles; 18 500 pound bombs; three 2,000 bombs; four M155 launchers (each with 18 68 mm NAR [free-flight rockets]); seven Belouga cluster bombs; three AS-30 air-to-surface guided missiles; and three Exocet antiship missiles.

Troop deliveries of the Mirage-2000 fighters were planned to begin in late 1983. Some 400 aircraft are to be built for the French Air Force, of which 200 will be used to accomplish air defense missions and the remainder as tactical fighters.

The MIRAGE-4000 MULTIROLE FIGHTER (Fig. 4 [figure not reproduced]) was developed by the firm on an initiative basis. In the opinion of the firm's specialists, it can be employed for air superiority missions and for delivering strikes against ground targets. In its aerodynamic configuration the aircraft is somewhat similar to the Mirage-2000 fighter, differing from it by the presence of forward aerodynamic surfaces (in the canard configuration) and the installation of two M53-5 engines. The capacity of the Mirage-4000 fuel tanks is approximately three times more than for the Mirage-2000. In addition, it can carry up to three 2,500 liter suspended tanks beneath the wing and fuselage.

The aircraft is equipped with an RDM radar, which subsequently is to be replaced with the more advanced RDI set. The built-in armament consists of two DEFA 30-mm cannon. The variants of suspended armament accommodated at 11 stations beneath the fuselage and wings are as follows: two medium-range and 2-8 short-range aerial combat air-to-air guided missiles; four air-to-surface guided missiles; 27 250 kg bombs or Durandal penetration bombs; 18 Belouga cluster bombs; and 14 250 kg guided bombs.



According to western press reports, the firm undertook development of the Mirage-4000 on its own funds with consideration of the potential opportunities for supplying it to the foreign market. One prototype Mirage-4000 was built by mid-1983 and is undergoing limited flight testing. According to the firm's specialists, full-scale testing of the aircraft, its airborne equipment and armament will not occur until contracts are concluded for supplying it to interested countries.

The MIRAGE-4A MEDIUM STRATEGIC BOMBER (Fig. 5 [figure not reproduced]) is a strategic nuclear weapon platform. The prototype made the first flight in mid-1959. Deliveries to the French Air Force were accomplished during 1964-1966. At the present time, judging from western press reports, there are 34 bombers in the order of battle with an additional four in a training sub-unit and ten in reserve.

The aircraft is equipped with a delta wing with a sweepback of  $60^\circ$  on the leading edge. High lift devices include two-section elevons (aileron-flaps) and airbrakes located on the upper and lower surfaces of each wing. A brake parachute is accommodated at the base of the vertical keel. The aircraft has a tricycle landing gear, with the main struts each having four wheels (tire pressure of  $12 \text{ kg/cm}^2$ ), and the forward strut has two ( $8 \text{ kg/cm}^2$ ).

The power plant consists of two SNECMA Atar-9K turbojet engines with a thrust of 7,000 kg each with afterburning. There are adjustable engine air intakes along the sides of the fuselage. Fuel is accommodated in wing and fuselage tanks. To increase flight range the aircraft can carry up to three 2,500 liter suspended tanks (two beneath the wing and one under the fuselage). The Mirage-4A also is equipped with an aerial refueling system. One cluster of three rocket boosters can be installed beneath each wing to provide a short take-off.

The aircraft's electronics include a radar for viewing the earth's surface and for fire control (with an antenna in the fairing beneath the central part of the fuselage). The primary armament is one AN-22 nuclear bomb suspended in a semirecessed position beneath the fuselage (behind the radar antenna fairing).

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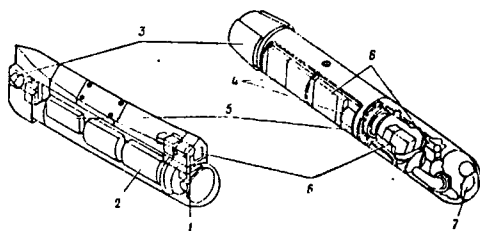
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## U.S. DEVELOPMENT OF LANTIRN SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 69-70

[Article by Engr-Col V. Rozanov]



Suspended pods with navigation equipment (on left) and target acquisition and fire control gear (on right) of the LANTIRN system:

1. Forward looking infrared [FLIR] set
2. Terrain-following radar
3. Environmental parameters monitor unit
4. Automatic target identification and Maverick missile launch control gear
5. EVM [electronic computer]
6. Digital converter of IR scan
7. FLIR
8. Laser rangefinder-target designator with automatic target tracking units

[Text] The LANTIRN (Low Altitude Navigation, Targeting Infrared for Night) targeting-navigation system being developed in the United States is intended, judging from foreign press reports, to provide single-place tactical aircraft with the capabilities of flying at low altitude and employing weapons against ground targets during the day or night in adverse weather conditions. System equipment is accommodated in two suspended pods (see diagram). One of them (weighing 190 kg, 198 cm long and 31 cm in diameter), which contains the navigation equipment, usually is accommodated on the left relative to the direction of the aircraft's flight and the other, with target acquisition and fire control equipment, on the right.

The pod with navigation equipment has a terrain-following radar, forward looking infrared [FLIR] station, computer unit, digital scan converter, environmental parameters monitor unit, and power source.

The radar (which operates in the frequency range of 12-18 GHz) was developed by the Texas Instruments firm. It uses varied digital methods for signal processing which, as American specialists believe, permit obtaining rather good terrain images in a broader azimuthal sector, which makes it easier for the pilot to maneuver when flying at low

altitude. In particular, a rather high resolution was achieved during tests of this station in which such objects as antenna masts were detected.

The FLIR set has a vertical field of view of  $21^\circ$  and a horizontal field of  $28^\circ$ . The thermal terrain image is formed on the screen of an electro-optical indicator against the windshield. The pilot uses the set when flying the aircraft day or night under conditions of poor visibility. According to the specifications, it must provide for obtaining clear terrain and target images at a distance of 5-6 km.

The pod with the target acquisition and fire control gear consists of three sections. Transmitting and receiving optical elements, the basic FLIR module, and the transmitter and receiver for the laser rangefinder-target designator are installed on a stabilized platform in the nose section. Electronic units, including the digital converter for scanning and processing target tracking and identification signals, the basic digital processor and a missile line of sight correlator are accommodated in the central compartment. The rear compartment contains the environmental parameters monitor unit.

The FLIR has two fields of view: narrow ( $2.25 \times 2.25^\circ$ ), intended for searching for, tracking and identifying moving targets; and wide ( $10.8 \times 10^\circ$ ) for detecting stationary targets, with automatic tracking of them after the set is switched to the narrow field of view.

A laser based on a neodymium-doped yttrium-aluminum-garnet serves as the rangefinder-target designator transmitter. The laser transmitter has a modular design and consists of a working rod, a passive modulator of resonator quality on dye, and a resonator mirror. The basic electronic stages are made on hybrid circuits. The wavelength of the laser emission is 1.06 microns. It is planned to install a  $\text{CO}_2$  gas laser in the working model of the rangefinder-target designator. An advantage of such a laser in comparison with solid-state lasers is considered to be the possibility of its use under conditions of fog and a smoky atmosphere.

The tactical employment of F-16 and A-10 aircraft equipped with the LANTIRN system and Maverick guided missiles with a thermal imaging homing head will be as follows. The aircraft approaches the target area at low altitude, using equipment of the pod containing navigation gear (the FLIR and terrain-following radar) and the aircraft's inertial navigation system. On the terminal attack leg it executes an evasive maneuver (a half-loop with half-roll and shifting into a dive on the return course) and the FLIR searches for targets by the scanning of an optical system to both sides of the direction of flight and outputs data for automatic target recognition. After the targets' detection and identification the homing head of the missiles is turned on and the missiles are launched. Selected targets are shown on a head-up display and the next target of interest is shown on another display on the instrument panel. It is believed that the LANTIRN system is capable of simultaneously tracking six different targets and outputting data for automatic launch of the Maverick missiles.

When employing guided bombs with a laser guidance system the pilot places the aircraft in a pitch-up condition in the vicinity of the target. At this time the target is automatically tracked and the laser source of illumination (the rangefinder-target designator) is turned on. The bomb is guided according to the laser emission reflected from the target.

Judging from foreign press reports, testing of a prototype of the LANTIRN system installed aboard a two-seat F-16B fighter was conducted in 1982 at Edwards Air Force Base, California. The aircraft also was equipped with a holographic head-up display with a field of view of  $30 \times 18^\circ$  (the field of view of conventional displays does not exceed  $20 \times 15^\circ$ ) and providing greater clarity of the displayed data. In late 1984 the U.S. Air Force command plans to conduct a comparative evaluation of FLIR sets being developed by the firms of Martin Marietta and Ford Aerospace, with the best of them to become part of the LANTIRN system in 1985. Automatic identification gear is being developed on a competitive basis by the firms of Hughes Aircraft and Martin Marietta, with plans to evaluate it in mid-1984. Flight testing is to be done at Edwards Air Force Base in two stages: both pods without the identification equipment will be tested in the first stage, and the full set of the LANTIRN system will be tested in the second. Two F-16B and one A-10 aircraft in the two-seat version as well as two F-16A and A-10 aircraft in a single-seat version will be assigned for this. In addition, it is planned to conduct additional flight tests in the northern parts of the United States which are closest in climatic conditions to the European war theater.

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## FOREIGN MILITARY AFFAIRS

### EFFECT OF NATURAL CONDITIONS ON COMBAT OPERATIONS IN BALTIC

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 71-76

[Article by Capt 1st Rank A. Korablev; passages rendered in all capital letters printed in boldface in source]

[Text] Seas and oceans long have played a substantial role in the history of mankind's development and often were the arena of rivalry and armed struggle among states striving for economic and political domination. With respect to their importance at the present time, foreign specialists emphasize that it not only is not decreasing but, to the contrary, is constantly growing. According to the foreign press, the military-political leadership of the aggressive North Atlantic Alliance is making the attainment of its goals in war directly dependent on the course of combat actions at sea. Therefore, in addition to building up the might of naval forces, NATO countries attach great importance to a study of the world ocean, and particularly to the collection, processing and accumulation of oceanographic data. It is believed that the conduct of operations in sea TVD's [theaters of military operations] will depend to a great extent on a correct forecast of the status of the environment, a knowledge of which will permit more effective use of existing and future naval armament systems.

This article reveals the views of western specialists on the effect of geographic, oceanographic and climatic factors on the employment of naval forces and naval aviation in the Baltic Sea.

The Baltic Sea is an inland sea which goes deeply into the European continent and is a connecting link between the North European and Central European TVD's. The bloc's strategists regard it as an important operational-strategic region which in case of war will become a site of the active employment of naval surface and submarine forces and naval aviation. This sea has a number of features (because of the effect of the aforementioned factors) which greatly distinguish it from the open ocean, and this will affect the nature of combat actions toward which NATO experts even now are aiming.

Foreign specialists include in the GEOGRAPHIC FACTOR the sea's position in latitude, its shape, dimensions, configuration of the shores, and configuration and nature of the coastline.

The sea's geographic position in latitude determines the predominant type of climate (which will be mentioned later) and the duration of hours of darkness. The Baltic Sea lies between 54° and 66° north latitude. In January the night here lasts from 14½ hours (at latitude 54°) to 18 hours (66°). As foreign experts state, the long hours of darkness in combination with short distances favor the conduct of combat actions, especially for the side with weaker aviation. But in June the length of nights at a latitude of 54° is around 5 hours, at 60° it is only one hour, and at 66° the sun is continuously above the horizon. Therefore naval actions in the summer months, when the majority of missions will be accomplished during hours of daylight, invariably will require reliable air support.

In the opinion of naval specialists, the shape of the Baltic Sea, which is connected with the ocean by straits, will determine to a considerable extent the mission for armed forces of the opposing sides for the initial period of war: for the enemy it will be to seize the strait zone to assure the movement of his ships into the North Sea; and for the navies of NATO countries it will be to maintain control over the strait zone.

The size of the sea also is of substantial importance. It extends 750 nm\* from north to south and 350 nm from east to west, which leads to the short distances between various points. For example, only 90 nm separate the island of Gotland (Sweden) from the Soviet port of Lepaya, and Bornholm Island (Denmark) is 50 nm from the Polish coast. As emphasized in the western press, this allows effective use of all types of aircraft and helicopters here. For example, the West German Tornado fighter-bomber (see color insert [color insert not reproduced]) flying at a speed of approximately 800 km/hr needs only 50 minutes to fly from the Schleswig/Jagel airfield to Kaliningrad and around 10 minutes to Rostock (GDR).

The short approach time permits using different air arms, accomplishing a target search in a large zone (within the established radius of action), pressuring the target for a long while, achieving tactical surprise (especially in low altitude flights) and performing search and rescue operations more efficiently (with a landing at allied airbases). It is noted that the side with air superiority will substantially restrict the enemy's capabilities to use large surface combatants (cruisers and destroyers) in the Baltic Sea if they are not provided with reliable air cover for the period of combat actions. The opposing side with insufficiently strong aviation will be forced to conduct naval operations for the most part during the hours of darkness or in bad weather. According to foreign specialists, a short approach time even will allow a weaker enemy to deliver surprise air strikes against sea and shore targets with a high likelihood of success.

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\*One nautical mile equals 1,852 meters.

The short distances between Baltic states also gives surface forces certain opportunities to achieve tactical surprise. For example, small fast combatants can conduct a hit-and-run operation (deliver a strike against the enemy and return to their own naval base) against a sea target at a distance of 120 nm in approximately 8½ hours, while surface combatants are capable of changing the areas of tactical deployment, dispersal or concentration of friendly forces in a few hours. The restricted size of the Baltic Sea permits conducting several sorties against an enemy target during offensive operations, which will hinder the defending side in restoring losses from previous strikes.

The layout of the shores and the stretch of coastline also have an effect on employment of naval forces and aviation. The foreign press emphasizes that the northern coast, particularly the Swedish coast (extending approximately 2,500 nm), is more convenient than the south coast for setting up a very far-flung network of naval bases (basing points) and for a prompt change in ship locations during combat actions depending on the situation at hand.

The configuration and nature of the coastline have a direct effect on the degree of vulnerability of operational bases to enemy pressure, as well as on the organization of a beach defense and a reliable system for observing the sea and the air space above it. It is noted that the shores of Sweden create favorable conditions for building well protected naval bases, basing points and underground (rock) cover thanks to their significant elevation above sea level and their indentation.

Foreign specialists also attach great importance to the presence of islands in coastal waters, which in their opinion will be used widely for supporting both offensive and defensive actions. In the first instance the islands bring the "forward line" from which hit-and-run operations will be conducted by light forces closer to enemy targets, as it were and, in the second instance, they extend forward from their coast a line of surveillance over enemy actions which permits taking necessary steps in advance and setting up an echeloned defense. As the western press emphasizes, it is very convenient to set up surveillance over the underwater, surface and air situation from the islands of Bornholm and Gotland, and to support the actions of friendly forces for disrupting enemy sea lines of communication. The presence of a large number of islands near the northern coast creates more favorable conditions here for the organization and reliable protection of shipping in coastal waters than, for example, along the southern and eastern shores. The nature of the coastline also determines the possibilities of employing mine ordnance for protecting coastal shipping, naval bases and ports.

The OCEANOGRAPHIC FACTOR, which directly affects the operating tactics of surface combatants and submarines and employment of their armament, includes the sea depth, nature of the seabed, currents, temperature, salinity and transparency of the sea water.

The Baltic Sea is primarily shallow, with approximately 60 percent of its area having a depth of less than 50 m. The greatest depth--around 400 m--is encountered northwest of Gotland Island; in other depressions it does not exceed 200 m, in the Great Belt Strait it is 13-23 m, in the Oresund it is 16-38 m,

in the western part of the sea 18-45 m, and in the central part 54-180 m. The average depth along the Swedish coast varies from 60 to 150 m, in the Gulf of Bothnia it is less than 23 m in the north and more than 126 m in the south, and in the Gulf of Finland it is 36-90 m. The depth is 18-36 m 15-20 nm from the southern and eastern shores.

The Baltic Sea's shallow waters restrict the use of large surface combatants as well as of large and medium submarines. The foreign press notes that for safe operation of a submarine the under-keel clearance must be at least 10 m. In addition, to prevent detection of the submarine from the air, there must be a layer of water 11-13 m deep above the highest point on the hull (over the fairwater). And so, as foreign specialists believe, the minimum sea depth providing a submarine of average displacement with safe operation under the water (without considering the need for maneuvering in depth to evade attack by enemy ASW ships and aviation) will be 35-40 m.

The shallow depths of the Baltic Sea favor the effective employment of mine ordnance practically throughout its area. It is noted that at depths down to 70 m it is more advisable to place primarily seabed influence mines, and to put moored mines at large depths (down to 400 m). It is recommended that the latter be placed at least 10 m deep, since otherwise they can be detected visually from the air by enemy aircraft. On the other hand, the shallow water, especially near the southern and eastern coasts, restricts the use of 533-mm torpedoes from surface combatants since after being fired they need a depth of 20-25 m and to 10 m during movement to the target. It is emphasized that these values change depending on the type of torpedoes (their size and weight), but in any case shallow sea depths will have a direct effect on the operating tactics of surface combatants equipped with torpedo ordnance, especially against targets proceeding near shore.

Foreign experts note that the shallow water, the nature and relief of the seabed, proximity and configuration of the shores, water temperature and salinity, condition of the surface layer and the existing noise background of the sea will influence the operating efficiency of sonars (GAS) in the Baltic.

The underwater topography of the Baltic Sea varies. The seabed is uneven and rocky in the northern part, and it is even and sandy-clayey in the south.

The surface layer temperature increases from south to north. The highest is in August (14°C in the Gulf of Bothnia, 15-16°C in the central part of the basin) and the lowest is in February (-3°C in the Gulf of Bothnia, 0° in the Gulf of Finland, and 0±1°C along the Swedish coast and 2°C in the central portion of the sea).

An abundance of fresh water entering in the continental run-off and precipitation determines the water's salinity, which is 11 parts per thousand at the sea surface only in the west, and in other parts it varies from 2 to 8 parts per thousand. In the deep layer the salinity of water coming from the North Sea through the straits as a lower current reaches 20 parts per thousand in the west and 10-16 parts per thousand in other areas.



As the foreign press reports, many years of observations of the Baltic Sea permitted foreign specialists to identify the following hydrologic features of the sea which substantially influence the operation of sonar equipment:

--Because of the shallow waters, the specific nature of the seabed and the presence of temperature gradients, special importance is gained by such phenomena as refractions of acoustic beams, absorption of acoustic energy, the reflection or reverberation of sound from the water's surface and the seabed, formation of an underwater sound channel, and a reduction in intensity of an acoustic signal;

--There is a high level of ambient sea noise, which is 5-10 db higher in shallow water than in deep water;

--An acoustical shadow zone in which a submarine can be lost appears at a short distance from an ASW ship at depths of 30 m, especially in coastal waters (up to 50 nm from shore). According to foreign specialists' estimates, this distance is approximately three times greater than a submarine's submerged depth at the moment of contact with her is lost.

On the whole, as western experts note, the sea's rapidly changing hydrologic conditions do not permit a sufficiently precise determination for forecasts of the path of acoustic beams and zones of acoustic illumination for various sonars.

Although the use of shipboard sonars with an antenna with a varying depth of submergence leads, in their opinion, to a significant increase in effective range (when the antenna is lowered beneath the thermal layer), it does not provide reliable protection for a submarine in areas of the sea with shallow depths.

The CLIMATIC FACTOR (winds, sea state, cloudiness, precipitation, ice cover, air temperature) also has a significant influence on the employment of ship forces and aviation. The Baltic Sea's climate basically is determined by the domination of air masses brought in by westerly winds from the Atlantic Ocean and from the land adjoining the sea.

A heavy sea is observed approximately from October through March, and gales also are frequent here. Waves up to 1.5 m high predominate in the fall and less often in the spring. There is a swell at all times of year, with wave height reaching 0.3-1.8 m at the entrance to the Baltic and 4 m in the central part of the basin. Waves more than 4 m high are encountered in stormy weather chiefly near the strait zone.

The sea state has an influence on the speed of surface ships and on their crews' combat effectiveness. Foreign specialists note that the use of small combatants and landing craft is seriously hindered for an average of 60 days in a year because of heavy wind and steep waves, and is impossible with a sea state of 5 or more.

The sea state also affects the operation of shipboard sonars. While in the open ocean their efficiency is influenced chiefly by the structure of the

vertical water temperature distribution, in the Baltic Sea a sea state of only 4 has a serious effect on sound propagation, since the reflection of acoustic beams from the surface increases intensively with wave development. Reverberation reduces the sonar's radius of action and a strong wind causes the formation of a large amount of air bubbles in the surface layer which absorb and scatter acoustical energy emitted by the sonar.

Clouds, rain and fog considerably degrade visibility and thus the effectiveness of combat activities by aviation and ships. Extensive cloud cover over the Baltic (an average of 70-80 percent) predominates from October through February, and moderate cover (40-60 percent) from May through July. Moderate cloudiness is observed for almost the entire year in the southern part of the basin. In the coastal zone cloud cover is unevenly distributed, decreasing from shore toward the sea in winter and spring months, and vice versa in late fall.

Visibility at sea is poor in winter and spring, with good conditions predominating in the summer and early fall. The lower edge of the clouds in the western part of the sea is observed at an average altitude of 300 m, with visibility in the range of 2.5-5 nm. Fogs are most frequent on the open sea from winter to early summer. The number of days with fog in various regions is from 20 to 70 per year.

The average annual precipitation in the north is 500 mm, in the south it is more than 600 mm, with up to 1,000 mm in some places. December has approximately 20 days with precipitation and there are 10 days during May-June. Thunderstorms are most frequent from May through August. Snow occurs more often in the northern zone of the sea, where it falls an average of 40-50 days a year, and 25-30 days a year in the eastern region.

Ice is an obstacle to navigation. In severe winters entire regions northwest of Gotland Island are covered with ice. It is emphasized that in some gulfs the ice hinders navigation for 60-120 days and stops shipping for 30-80 days. Such a picture is observed for 10-30 and 5-20 days respectively along the southern coast. The presence of ice also has an effect on the operating efficiency of shipboard sonars. For example, in pack ice locations the ambient noise level is 5-10 db higher than without the pack ice. A heavy wind with snow also increases the ambient noise level, and the blows and scraping of ice-floes hinder the classification of sonar contacts.

The mean air temperature in February changes from 0° to -3°C from west to east, and in the Gulf of Finland it drops to -8°C. In August the mean air temperature rises to 15-17°C. Humidity and temperature have a certain effect on radio wave propagation as well. It is stressed that the phenomenon of superrefraction arises rather often here, resulting in a possible increase in the operating range of radars and radio communications equipment.

Taking the aforementioned features of the Baltic Sea into account, foreign specialists make certain forecasts relative to the nature of combat actions which will be conducted here with the outbreak of an armed conflict. In their

opinion the basin's size substantially limits the use of surface combatants with a displacement greater than 1,500 tons. Nevertheless, they do not preclude the possibility of destroyers and cruisers participating in actions at sea, but only if NATO naval forces have full superiority in the air, on the water and beneath the water in the zone of contact with the enemy. But even if these conditions are observed, emphasizes the western press, large surface combatants remain very vulnerable not only to aviation but also to submarines, small combatants and mine ordnance.

For this reason it is deemed advisable to employ primarily small surface combatants (with a displacement up to 1,000 tons), diesel submarines (up to 500 tons, Fig. 1 [figure not reproduced]), guided missile patrol boats (Fig. 2 [figure not reproduced]) and motor torpedo boats for operations on the Baltic, with the extensive use of mine ordnance. In the opinion of NATO specialists, modern small combatants and small submarines allow attainment of the necessary combat results on the one hand and, on the other hand, this leads to a dissipation of enemy forces. There also are favorable opportunities here for conducting landing operations.

Foreign experts believe that in comparison with the open ocean, numerous combat actions varied in nature, tactically sudden, short-lived and intensive in effect will predominate in the Baltic Sea. It is expected that the belligerents will suffer heavy losses in personnel and combat equipment as a result of such actions.

The foreign press notes that NATO naval forces will accomplish the following OFFENSIVE MISSIONS in operations on the Baltic Sea: destruction or weakening of the enemy fleet (warfare against submarines and surface combatants, delivery of strikes against landing forces in bases and on the sea passage; mining of coastal waters, channels and likely transit routes of surface combatants, submarines and convoys; hit-and-run actions by guided missile and motor torpedo boats against anchorages and roads; delivery of bombing and strafing, missile, and gun strikes against shore targets), disruption of sea lines of communication, conduct of amphibious landing operations, and reconnaissance-sabotage raids by frogman subunits.

Foreign specialists include among DEFENSIVE MISSIONS: blockade of the Baltic straits, advance minelaying on approaches to accessible assault landing sectors of the friendly shore and islands, antilanding defense of the shore, defense of friendly sea lines of communication, screening the coastal flank of ground forces, antisubmarine defense of ship groups, landing forces and convoys, support to submarines in their departure for combat patrols and their return to base, and the defense of naval bases and anchorages from the sea.

The western press emphasizes that to accomplish the above missions the specific nature of the Baltic Sea will require not only the appropriate complement of naval forces, but also special tactics for their employment which take account of this basin's geographic, oceanographic and climatic factors. The NATO experts' comprehensive study of the Baltic Sea's features from a military standpoint is vivid proof of the purposeful preparation of NATO naval forces for aggressive operations in this part of the world ocean.

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## FOREIGN MILITARY AFFAIRS

### U.S. NAVY'S RECONNAISSANCE-SABOTAGE SUBUNITS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 76-80

[Article by Capt 2d Rank (Res) V. Mosalev; passages rendered in all capital letters printed in boldface in source]

[Text] In expanding the scope of preparations for unleashing a new war, U.S. ruling circles are giving very careful attention to special-purpose troops. The latter are considered one of the effective means of fighting the national liberation movement and they are a tool for direct intervention in the internal affairs of independent states to destabilize and overthrow their lawful governments following an anti-American and anti-imperialist course, and to support the prowestern forces of these countries.

There are special-purpose troops in all branches of the U.S. Armed Forces, including the Navy, where they are represented by reconnaissance-sabotage forces (special forces) of the Atlantic and Pacific fleets. They began to be set up only from mid-1943 after the United States had lost around 70 percent of its assault landing craft and a third of the personnel when landing a force on the Pacific atoll of Tarawa (Gilbert Islands) through ignorance of natural obstacles on approaches to the beach and the location of minefields, but as early as the summer of 1944 they made a substantial contribution to the success of the Normandy Landing Operation (during which frogmen detected and destroyed some 2,500 antilanding obstacles and neutralized 200 mines). Their especially rapid development was noted during the aggression in Vietnam, when 3,000 frogmen (as the western press call personnel of the reconnaissance-sabotage subunits) were trained in 1965 alone, and of these 800 took a direct part in combat actions. The American press of those years cynically wrote: "The teams of frogmen gave a good account of themselves in Vietnam. They made an enormously greater proportional contribution to the war than representatives of any other combat arm."

With the arrival of the Reagan administration to power in the United States the Pentagon bosses again directed their gaze at the special-purpose troops, which, they assert, should be revived, activated and strengthened to demonstrate U.S. might where the use of conventional armed forces would be premature, inappropriate or impossible.

According to foreign press reports, the U.S. Navy's reconnaissance-sabotage forces include detachments of scout-saboteurs and frogmen, squadrons of support boats, and separate special detachments for combat actions in forward areas of the ocean theaters. Organizationally the aforementioned subunits are placed in special-purpose groups of the Atlantic Fleet (with headquarters at the Little Creek Naval Base, Virginia) and Pacific Fleet (Coronado, California). Separate detachments are stationed at the Roosevelt Roads Naval Base (Puerto Rico) and Subic Bay (the Philippines), as well as in Great Britain.

The SCOUT-SABOTEURS (200 persons in a detachment including 20 officers) are experienced professionals who know two or three military specialties and foreign languages. They are intended for performing reconnaissance and sabotage in naval bases, ports, dispersed-basing points, at roads and anchorages, and in enemy coastal areas. Their missions include the destruction of headquarters, command posts, communications centers, control points, large surface combatants, vessels, submarines, land-based missile systems, bridges, dams, docks, transportation arteries, pipelines, cable communications lines, and various depots and other military and industrial facilities. In addition, they may be assigned missions of search and rescue of aircraft crews shot down in the enemy rear and for delivering important intelligence obtained by other forces.

Scout-saboteurs operate in groups (up to 12 persons) both at full and at incomplete strength (most often six persons, more rarely two or four). A mandatory condition for manning a group is the inclusion of one or more persons familiar with the local language.

Reconnaissance-sabotage groups are delivered to a designated area (to the enemy coast) by underwater, surface and airborne platforms. The western press emphasizes that any submarine can be used to transport frogmen. In addition, the U.S. Navy has a diesel submarine, the "Grayback" (a former missile submarine), specially fitted for supporting their activities. Scout-saboteurs make their way to shore using underwater means of movement (one-, two-, four-, or five-place), towing vehicles or fins (Fig. 1 [figure not reproduced]), which they then have to conceal.

Combatants, landing ships as well as auxiliary vessels are widely used as surface platforms. Frogmen can be delivered to shore by special LCSR and "Sea-fox" fast boats (capable of carrying some 20 persons a distance up to 200 nm at a speed of 35-40 knots), the "Aqua Dart" surface towing vehicles (three persons for 50 nm at a speed of 20 knots) and air cushion vehicles. The Mars inflatable boats with or without a detachable, quiet 35 hp motor usually are used for a direct landing ashore (Fig. 2 [figure not reproduced]). The boat holds seven persons and is capable of delivering them over a distance of 20 nm at a speed of 27 knots. It is submerged and concealed near shore.

Scout-saboteurs are delivered by air using special aircraft and helicopters. They land on the water or ground on parachutes (guided, gliding or ribbon parachutes) and additionally from a helicopter without a parachute from a height of 5-6 m to the water (with a helicopter speed up to 35 km/hr) or on land with the help of a 45 m cable.

The reconnaissance-sabotage groups are removed after mission accomplishment by underwater, surface and airborne methods. In the first instance the frogmen locate underwater gear and proceed to a prearranged area where they are awaited by a submarine and in the second instance they inflate a boat and put to sea where they rendezvous with their supporting forces.

Airborne removal is accomplished by special aircraft and helicopters. The MC-130E aircraft have devices for recovery without landing, the "midair snatch" system, which permits lifting two persons simultaneously or 230 kg of cargo from small areas on rugged terrain or from the water's surface. Helicopter recovery uses a rope ladder or a fast winch with a line to which various suspended devices are attached.

FROGMEN (115 persons in a detachment, of whom 15 are officers) are intended for the following objectives: reconnaissance and destruction of manmade and natural underwater and onshore obstacles in the vicinity of an amphibious assault landing; clearing passages to landing points and making passages in minefields in the water and at the water's edge; marking lines of movement and passages for assault landing craft to shore. In some instances frogmen are used for diversionary actions, reconnaissance and other operations not involving support to landing operations.

According to foreign press reports, frogmen operate in groups of six or twelve persons. They usually are delivered to the area of a proposed assault landing by surface combatants (sometimes by submarines) 3-4 days before the operation begins, or directly to the site of operations by fast boats or helicopters.\* The evacuation of frogmen after mission accomplishment is by these same means.

According to foreign press reports, the Atlantic Fleet special-purpose group additionally includes a marine animals subunit intended for combating frogmen and searching for sunken objects. It includes eight trainers and several trained dolphins and sea lions. The animals can be moved over long distances by any means of transportation in special transporters equipped with a life support system.

SQUADRONS OF SUPPORT BOATS are intended to carry out the landing, recovery, supply and, in some cases, gun support of reconnaissance-sabotage groups in enemy coastal areas and to conduct reconnaissance there. Each squadron has up to 30 fast boats (Fig. 3 [figure not reproduced]) and more than 250 persons including 26 officers.

Frogmen's GEAR depends on the mission to be accomplished, the time to accomplish it, strength of the reconnaissance-sabotage groups, the method of their delivery and landing and other factors, and may include the following: breathing equipment, diving suit, mask, air line, underwater goggles, fins, life jacket, depth gauge, underwater compass, watch and lantern, and knife.

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\*Concerning actions by frogmen in support of landing operations see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 12, 1982, pp 75-76--Ed.

Communications beneath the water is accomplished using signal devices--acoustical (a range up to 3,700 m), ultrasound (up to 1,350 m) and electrical (up to 150 m). A handheld VHF radio (3-5 km) serves for communications within the group and with supporting forces, and an HF or satellite radio serves for communications with the command element. Millimeter wave radios installed in field binoculars or laser transceivers can be used for secure communications within line of sight, as can laser signaling devices in the form of a round handheld lantern for giving encoded light signals and directions (25-30 km).

Sonar equipment capable of detecting objects at a distance of 110-190 m and providing guidance at a distance of 1,850 m is used for the detection of underwater targets and for guidance to noise-producing objects and hydroacoustic beacons. Guidance can be accomplished in addition with the help of special homing devices consisting of miniature hydroacoustic beacons and a handheld receiver (effective range 300 m).

In addition to conventional field binoculars, frogmen use infrared binoculars, goggles, instruments and sights which allow detecting a person at a distance of 100-600 m. There is an infrared device for nighttime observations and for photography beneath the water (up to 60 m) and on its surface.

There are miniature warning devices to warn frogmen of exposure to enemy radar. The devices make it possible to determine the direction to an operating radar and its type before the group is detected by it.

Frogmen also can use laser target designators intended for guiding aircraft, missiles and projectiles with laser homing heads to a target.

During operations in the deep enemy rear a reconnaissance-sabotage group is supplied with a manpack LORAN radio navigation system receiver display which allows determining position with an accuracy up to 100 m.

Frogmen have conventional firearms, including pistols, machine pistols (with silencer and laser sight), automatic rifles, machineguns, rocket launchers and hand grenades (fragmentation, high explosive, incendiary, smoke and chemical); and special weapons: air pistols (with optical sights firing needles to 10 m in the water and 250 m in the air) and rocket pistols (with a range of fire of 50 m in the air and beneath the water), as well as underwater rocket launchers.

Underwater weapons include special sabotage devices and demolition charges, including atomic demolitions. Wide use is made of standard destructor units, shaped charges, distributed charges and ribbon charges. Standard destructor units are contained in special demolition bags. Each frogman can tow up to five such bags.\*

MANNING AND TRAINING. The reconnaissance-sabotage subunits are manned with naval servicemen (up to lieutenant inclusive) in the age of 18-32 who have

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\*For more detail about frogmen's gear see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No. 3, 1979, pp 66-70--Ed.

undergone a loyalty check and are fit from a health condition to serve in special-purpose troops. Selected candidates must not have a fear of water or explosives or suffer from diseases of motor organs or claustrophobia. They pass the norms for swimming (300 yards on the back and side in 9 minutes or 100 yards each on the chest, back and side in 11 minutes) and running (1.5 miles in 15 minutes).

Special attention in the selection is given to the presence of such traits as physical endurance, emotional balance, the ability to remain calm under extraordinary conditions, an aggressive nature, agility, reaction speed and quick thinking.

Selected personnel undergo a 16-week course for frogmen at special frogman schools in Little Creek (Atlantic Fleet) and Coronado (Pacific Fleet). For the first three weeks there are practices in swimming and running, and they study survival and the use of inflatable boats and radio communications. Emphasis is placed on practical activities with the simulation of actual conditions under which they will have to operate. During the last ten weeks the cadets take reconnaissance training and are taught the fundamentals of demolitions. Great importance is placed on a check of how the disciplines have been assimilated.

During the first 36-hour exercise for the record there is an evaluation of the ability to row inflatable boats to great distances, they set up tents, and there are practices which include concealed infiltration into the enemy rear and to sabotage targets, setting up secret shelters, and camouflage. The second weeklong exercise for the record is devoted to how trainees can operate under the water at various depths, reconnoiter underwater obstacles, select various demolition charges and place them correctly on the obstacles. During the third and most difficult weeklong exercise for the record the cadets negotiate an obstacle course (Fig. 4 [figure not reproduced]) after a strenuous forced march, with half-pound explosive charges being detonated in their immediate vicinity, and they undergo tests for going a long while without food or sleep. During the last three weeks of the course there is parachute training which consists of practicing day and night jumps with the parachute from aircraft (height of 400 m) and helicopters (460 m) with a wind speed near the surface of the ground and water of up to 9 and 12 m/sec respectively. After completing the course graduates receive the qualification of frogman and are sent to the frogman detachment of the corresponding fleet for subsequent duty and for improving proficiency.

During their service the frogmen train regularly in blowing up underwater objects, make parachute jumps (at least once every three months), and after six months undergo a qualification test in diving, during which two dives are made during the daytime to a depth of 36.5 m with a ten minute stay there, and two swims (day and night): with an aqualung for 914 m, and while maintaining a given compass course for 460 m.

The most capable and best trained persons from among the frogmen in the age up to 30 years are sent at their request and on the recommendation of their immediate superior to special two-year training courses for scout-saboteurs at



frogman schools. In addition they undergo training at special-purpose troop training centers of other branches of the Armed Forces. Here the students study methods of reconnaissance-sabotage activity, foreign languages, American and foreign weapons, demolitions, radio communications, techniques for stealthy infiltration into the enemy rear and to planned targets, evading pursuit, various methods of escaping imprisonment, murders with or without weapons, jungle fighting, and practices in driving cars and motorcycles, firing, and parachute jumping.

At the end of the courses they receive a scout-saboteur's qualification and are sent for further duty to scout-saboteur detachments.

Operating tactics of reconnaissance-sabotage forces are practiced during combat training the year around. Their personnel take part in all landing exercises arranged by the U.S. Navy and within the NATO framework. In addition, special exercises are held both independently and in coordination with special troop subunits of other branches of the U.S. Armed Forces or with similar subunits of the navies of member countries of aggressive blocs.

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## FOREIGN MILITARY AFFAIRS

### DEVELOPMENT OF FRENCH NAVAL SONAR GEAR

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 81-86

[Article by Engr-Capt 2d Rank (Res) F. Voroyeskiy, candidate of technical sciences; passages rendered in all capital letters printed in boldface in source]

[Text] The development of underwater surveillance and antisubmarine weapons control equipment in France is determined to a significant extent, as western military specialists believe, by the experience accumulated by firms supplying military electronics and developing and producing sonar equipment, and by the great competitive capability of French sonar gear because of its high technical level, leading to expanded deliveries to the navies of other capitalist states (including the United States, Great Britain and the FRG).

Coming ever closer to NATO naval forces, the French naval command does not hide the fact that the primary purpose of this equipment is to support the struggle against Soviet submarines.

The basic characteristics of sonars (GAS) with which French naval surface combatants, submarines and helicopters are fitted or are being fitted are given in the table.

The majority of SONARS FOR SURFACE COMBATANTS are active panoramic sonars with up to 360° field of view in azimuth. They have antenna systems built into the ship hull or towed (with a fixed or variable depth of submergence).

There also is a certain number of low-frequency direct-listening sonars with towed antenna systems used for reducing the effect of noises caused by a ship's machinery and hull on characteristics of the sets' receiving channels. A change in submerged depth of the antenna system provides best conditions for observing a target with consideration of the hydrologic situation in a given part of the sea.

Certain sonars with which French surface combatants have been equipped since the 1970's are examined below.

Basic Characteristics of French Navy Sonars

Sonar Designation	Band, KHz Number of Operating Frequencies	Work Mode	Antenna System	Platforms
<i>Surface Combatant Sonars</i>				
DURV-23D	$\frac{5}{4}$	Active (panoramic, sector, step), passive	Built-in (48 columns)	"Georges Leygues," "Suffren" and "Tourville" class guided missile destroyers; "Surcouffe" Class destroyer; and destroyers "Aconit," "Duperre" and "La Galissonniere"
DUBV-24C	$\frac{5}{4}$	"	Built-in (24 staves)	"Dupetit Thouars" Class guided missile destroyers
SS24 (Mod 1)	$\frac{5}{3}$	Active panoramic	"	ASW ships with displacement above 1,000 tons
DUBV-43B	$\frac{5}{4}$	"	Towed (24 staves)	"Georges Leygues," "Suffren" and "Tourville" class guided missile destroyers; "Surcouffe" Class destroyer; and destroyers "Aconit," "Duperre," "La Galissonniere"
SS48 (Mod 1)	$\frac{5}{3}$	Active and passive panoramic	Built-in (48 staves)	Destroyers, frigates
DUBA-25 (Tarpon)	$\frac{7.5-10}{3}$	"	Built-in (36 staves)	"d'Estienne d'Orves" Class guided missile frigates
Beluga	11, 12, 13	"	Built-in (24 staves)	Ships with 1,500-4,000 ton displacement
Remora	11, 12, 13	"	"	Ships of 200-1,500 ton displacement
TSM2600	11	"	"	ASW ships of small displacement
TSM2620	12	"	"	ASW ships (corvettes)
TSM2630	13	"	"	Project F2000 frigates
DUBA-21B	100	Active panoramic	Built-in, without fairing	"Circe" (France) and "Alkmaar" (Netherlands) class minesweepers
DUBM-41B	• Simultaneously uses two frequencies separated by 50 kHz	Active with scanning	Towed side-looking (three separate antenna elements)	Mine warfare ships
<i>Submarine Sonars</i>				
Eledone	5	Active with scanning, passive panoramic	Built-in active and passive (32, 64, 96 columns)	.
DUUA-2A, -2B	8.0, 8.4, 8.5	Combination	Built-in	"Daphne" Class, CNA72 and other submarines with displacement up to 1,600 tons
DUUX-5 (Fene-ton)	2-15	Passive panoramic	Built-in passive (3 hydrophones)	.

Basic Characteristics of French Navy Sonars

Sonar Designation	Band, KHz	Work Mode	Antenna System	Platforms
	Number of Operating Frequencies			
Helicopter Sonars				
HS12	$\frac{13}{3}$	Active panoramic, passive panoramic	Lowered with variable depth	Lynx ship-based ASW helicopters
DUAV-4	.	Active and passive	Lowered with variable depth directional	WG.13 Lynx ASW helicopters

The DUBV-23D sonar (the Sintra firm, Fig. 1 [figure not reproduced]), with a cylindrical antenna system, is intended for the search, detection and support of attacks against enemy submarines. It is installed in various classes of guided missile destroyers. It uses pulses with a tonal and frequency modulated filling by the linear law. Pulse duration is 4, 30, 150 or 700 milliseconds, with the cadence adjustable depending on the selected echo-sounding range. Transmitter power is 96 kw, with a mean effective range up to 20 km and a maximum range scale of 44 km. Data received by the sonar are processed by a special processor and displayed on a main plan position indicator [PPI] and remote PPI's.

The DUBV-24C sonar (Fig. 2 [figure not reproduced]), installed in the "Dupetit Thouars" Class guided missile destroyers, differs from the previous sonar in having half the power (48 kw) and in the duration of pulses emitted (5, 30, 150 and 4,700 milliseconds). Its antenna system consists of 24 staves of transducer elements.

The SS24 set with three modifications has been developed to replace the DUBV-24C. The first modification operates on three frequencies in the band of around 5 kHz in an active panoramic mode (the antenna system built into the ship hull has a diameter of 106 cm), and the second modification operates on two frequencies in the band of around 10 kHz (68 cm). The third modification is similar to the second, but it has a towed antenna system.

In addition to the DUBV-23D, which has a built-in antenna system, the DUBV-43B (the firm of Sintra) with a towed antenna system (a submerged depth of 10-200 m, distance from towing ship 250 m, towing speed 4-24 knots, Fig. 3 [figure not reproduced]) has been installed aboard surface combatants. The antenna (100 cm high and with a diameter of 120 cm) is accommodated in a special body 550 cm long and 170 cm wide, and weighs 7.75 tons in the water. It is lowered into the water and hoisted aboard ship with a lifting-lowering device. Transmitter power is 96 kw and maximum range is 25 km. On the whole the sonar is close to the DUBV-24C in design.

Three modifications of the SS48 sonar have been developed to replace the DUBV-23D and DUBV-43B sonars being used aboard ships of the basic types. These modifications provide for automatic tracking of up to 12 targets and their display on three-color PPI's. They operate in a continuous emission mode with frequency modulation of signals during emission and coherent processing of echoes when receiving. The first modification has a built-in system 164.3 cm

high and 186.4 cm in diameter, and the second has a towed antenna system with variable submergence depth. The third modification differs from the second in the operating frequencies (two in the band near 10 kHz).

The DUBA-25 (Tarpon) medium-range sonar (with display scales of 2.5, 5.5 and 11 km). Its antenna system, built into the ship hull on a stabilized platform, has a diameter of 110 cm. In the active mode the sonar emits tonal signals or pulses with linear frequency modulation (their duration is 30 and 90 milliseconds). The information received is processed with the help of an EVM [electronic computer], shown on a display and output to other ship systems. The set is serviced by one operator. There is a modification of this sonar (TSM2400) with a towed variable-depth antenna.

The Diodon family of sonars (of the Thompson-CSF firm) includes two modifications: the Remora for ships of 200-1,500 ton displacement; and the Beluga for ships of the main types. The latter, which is a long-range sonar, provides for automatic detection, classification and tracking of up to 12 targets simultaneously (the Remora only three). In the active mode the set operates on one of three frequencies (11, 12 or 13 kHz) using fixed pulse or frequency modulation of signals (pulse duration of 20, 80 and 200 milliseconds respectively). A passive search in the 10-14 kHz band, and the detection and classification of various sound sources including torpedoes of an attacking enemy ship can be performed simultaneously with or separately from the active mode. Data are displayed on a PPI of around 40 cm in diameter with storage and accumulation of data on all targets during 20 minutes of surveillance. Both sets also can operate with a towed antenna.

A new series of active sonars presently is being developed (the passive mode also is provided for) in which extensive use is made of microprocessor technology, advanced data display equipment and other achievements of science and technology aimed at increasing effective range, automating the work, and improving the reliability and effectiveness of the data processing system. These sets consist of modular elements including the antenna system in a fairing, transmitter, receiver, operator consoles, and data processing and display units. The capability is provided for being connected to fire control systems and there is a system for built-in monitoring of the operation of various assemblies and units. Individual parts of previously produced models can be used in a majority of the new Thompson-CSF sonars, particularly the towed antenna systems in special bodies of the Diodon sonar or the antenna of the DUBA-25 sonar.

The body of the Diodon sonar towed antenna system has high hydroacoustic characteristics and allows it to operate with a ship speed up to 37 knots. A compact towed antenna system (20-30 kHz band) and a low-frequency antenna system (5-7 kHz) also have been developed for operation with a powerful sonar, and they can be roll-stabilized.

The new series of sonars uses transmitters built according to the modular principle as well as receivers which realize necessary signal amplification and filtration characteristics, form the radiation pattern, preclude reverberation interference, and provide for coherent signal processing. All the new

sonars have 48 channels which operate simultaneously and in real time. The number of receiving channels is determined by the need for having a given frequency band width and by the number of staves in the antenna systems.

These sonars use multicolor television-type displays. Control consoles are provided with one or two screens and each sonar is serviced by one operator.

A new version of the Diodon set already is in production (in three modifications: TSM2600, TSM2620 and TSM2630). It differs from the old one in operating frequency, emitted power, complexity of the data processing and display system, and weight-size characteristics. The TSM2630 modification was chosen for outfitting the new Project F2000 frigates. Production also has begun on two modifications of the Tarpon sonar (TSM2710 and TSM2730), which operate on frequencies in the 7.5-10 kHz band, and the small Salton (TSM2640) with a towed, variable-depth antenna system (20-30 kHz band). The low-frequency Lancon sonar (TSM2830) is being developed, intended for ASW ships with large displacement.

New sonars intended for the search and classification of mines also are being used widely. For example, minesweepers being produced under a tripartite agreement for the French, Belgian and Dutch navies are being fitted with the Ibis-3 minehunting sonar. Judging from foreign press data, the detection range is 100-600 m and their classification range is 100-200 m from the ship's stem.

The antenna is stabilized in roll ( $\pm 15^\circ$ ) and pitch ( $\pm 5^\circ$ ) and provides for operation over 80 sound channels. In the active mode there is a panoramic view of  $\pm 175^\circ$ , as well as a sector view: within limits of 30, 60 and  $90^\circ$  for target detection and 3.5 and  $10^\circ$  for classification. Duration of emitted pulses is 0.2 and 0.5 milliseconds, and beam width is  $1.5^\circ$ .

Another version, the Ibis-5, uses the more compact TSM2022 sonar, manned by one operator. Its antenna system needs a trunk in the ship's bottom of only 75 cm diameter, while the span of this antenna's base reaches 1.5 m. The antenna system unfolds as it is raised into the trunk.

Mine warfare ships of the French Navy are fitted with the DUBM-41B sonar for detecting seabed mines and other small targets. Its side looking antenna (with a submergence depth around 100 m) consists of three separate elements and is towed at a height of 5.5-7.5 m from the seabed at a speed of 2-6 knots. The sonar is active, with scanning (the scan strip is 200 m and resolution is 5 cm), and operates on two frequencies with a separation of 50 kHz.

The firm of Thompson-CSF has begun development of a side looking sonar with high resolution for surveying channels and approaches to naval bases. The foreign press notes that it will permit the detection both of moored and seabed mines on the continental shelf. This sonar resembles the DUBM-41B in design and operating principle, but the submergence depth of its towed antenna system will be increased to 300 m.

SUBMARINE SONARS of the French Navy are divided into active-passive and passive only (direct-listening). All of them are intended for detection and support of weapons control in firing against various targets. In contrast to surface combatant sets, considerably more attention was given in their design to the direct-listening portion, and the operating frequency band was expanded considerably.

The most sophisticated is the Eledone sonar made by Thompson-CSF. As the foreign press reports, it underwent sea trials in 1981 (20 such sonars already have become operational aboard the submarines of five West European countries). It has a modular design allowing it to be made up in different versions depending on the class of submarine and availability of free space in compartments. It is envisaged in particular that an additional operator console will be installed if necessary. The receiving antenna has a cylindrical shape (with a diameter around 2.5 m) and is accommodated in the submarine bow. This antenna forms 128 receiving channels, which comprise a circular radiation pattern. The receiving device is common to all sonars of the Eledone series and operates in the 2-80 kHz band. The sonar has automatic tracking channels providing for the simultaneous tracking of 4-12 targets. With a high signal-to-noise ratio (10 db) the automatic tracking accuracy is  $0.7^\circ$ , and it is  $0.1^\circ$  in specially equipped versions of the sonar. The set operates in the 2.0-7.35 kHz or 7.35-27 kHz frequency band. The accuracy of direction finding for operating sets in these bands is  $3^\circ$  and  $5^\circ$  respectively with a signal-to-noise ratio greater than 14 db.

The active part of the Eledone sonar uses a directional antenna system, a 4 kw transmitter operating on a frequency of 5 kHz, and receiving channels common with the direct-listening part of the set. The effective range in the active mode is 100-1,400 m. Information is displayed on a colored or black and white television display or a registering device. The sonar set may include an instrument for measuring the acoustic wave propagation velocity, an acoustic field plotter, a small acoustic telephone for communications with other submarines, and an emergency buoy.

The QUUX-5 (Fenelon) sonar of the Sintra firm is a passive, panoramic sonar for automatic direct-listening and tracking of four targets in a  $\pm 120^\circ$  sector from the starboard and port sides (2-15 kHz band). The data obtained are shown on the sonar display and transmitted to the submarine fire control system. The antenna system consists of three hydrophones located on each side of the submarine with a base of 20-48 m, which permits determining the distance to a sound source. The sonar is supplied to 12 capitalist countries.

AIRBORNE SONARS include airborne sonobuoy (RGB) systems and helicopter sonars.

The LAMPARD (TSM8210/8220) system, intended for the new Atlantic land-based patrol aircraft, is the most modern airborne equipment for processing signals from sonobuoys which is being installed in aircraft and helicopters of French naval aviation. The basis for its design is the modular principle, providing for different versions to be put together. For example, Atlantic aircraft are equipped with two identical sets of the TSM8210 gear, each of which can be used independently of the other. One set (with a total weight of 140 kg) is

installed aboard aircraft and helicopters with a lesser load capacity. The lighter version, the TSM8220, weighs 70 kg and is manned by one operator, but it does not permit working with active directional sonobuoys.

Acoustic signals received by various sonobuoys are converted and transmitted in the VHF band to the aircraft, with one receiver receiving them over eight channels. These signals initially are processed in an analog form, and then in digital form. Information is displayed on a television screen and a registering device. These data are recorded and updated and if necessary can be placed on the screen again. Active sonobuoys are controlled from the aircraft via a VHF transmitter of a remote command device (their operating modes are changed), including the transmission of continuous signals or single acoustic pulses, short or long pulses and so on.

The location of a detected submarine is determined relative to the sonobuoys, which are subject to drift. Therefore information on their location must be updated constantly, which is done by the aircraft's successive overflight of the buoys, their radio direction finding and display of the information received on a special "upper situation" display. Data being received by the airborne sonobuoy system are transmitted to the force ASU [automated control system] and compared with information received from other surveillance assets. This is necessary for controlling the operation of all ASW forces.

The firm of Thompson-CSF presently is producing the DSTV-4M and DSTV-7 sonobuoys for the French Navy. Both buoys are passive and omnidirectional (the size of the second is three times less than the first).

The Sintra DUAV-4 dipping sonar is operational aboard the WG.13 Lynx light ASW helicopters (Fig. 4 [figure not reproduced]). It includes three basic assemblies: antenna in a special body with quiet servodrive (a height of 83 or 107 cm and a radiation pattern width of 18° or 9° respectively); hoisting-lowering device with a unit for determining drift and a hydraulic drive (cable length of 120 or 170 m); an electronics unit including transmitter, receiver, data display device, control panel, cable connector and rack.

The HS12 is another helicopter sonar of this firm which operates in the active and passive modes on three retunable frequencies in the 13 kHz band. The set performs automatic tracking of two targets. Its antenna system contains 12 staves of piezoelectric elements and has a drift correction unit, error display and bathythermograph for determining optimal submergence conditions. The helicopter's permissible speed in hunting a submarine is 3 m/sec and there is a 300 m cable connecting the antenna with the airborne equipment.

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## FOREIGN MILITARY AFFAIRS

### WEST GERMAN ANTISHIP-MISSILE DEFENSE SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) pp 86-87

[Article by Engr-Col N. Grishin, candidate of technical sciences, docent: "West German Shipborne ZRK (Surface-to-Air Missile System)"]

[Text] The United States and the FRG, partners in the aggressive NATO bloc, are testing the shipborne surface-to-air missile [SAM] system, the ASMD\*-- Antiship Missile Defense--intended for combating antiship missiles (PKR's) and low-flying aircraft and helicopters at short ranges. It was developed by the American firm of Pomona [sic] on order from the naval forces of these countries, which later were joined by the Danish Navy (the development began in June 1979 under an \$85 million contract).

To speed up the system's development a number of assemblies of series SAM systems was used in it. For example, the XRIM-116A missile included in the system uses elements of the Stinger SAM infrared homing head, the warhead and solid-fuel engine (1,360 kg thrust) of the Sidewinder airborne missile, and the target acquisition radar, base and the elevating-traversing gears for the experimental launcher were taken from the Vulcan-Phalanx shipborne gun system.

The missile's launch weight is almost 72 kg, it has a length of 2.8 m, a body diameter of 127 mm, maximum flight range of some 9 km and a speed of Mach 2. In connection with the fact that a majority of modern PKR's have an active radar homing head, the homing head of the XRIM-116A SAM has a receiver which picks up the signals of the antiship missile's radar in addition to having an infrared channel which reacts to the thermal emissions of the antiship missile motor. In the opinion of foreign specialists, the use of missiles in the ASMD system with such a combination passive homing head improves the jam-resistance and assures realization of the "fire and forget" principle.

The missile (its flight testing began in September 1980) is stored in a fiberglass container and is launched from it. The container's design provides the SAM with a rotating motion about the longitudinal axis, which permitted getting by with only two receiving antennas (instead of four on a nonrotating missile) and two control surfaces (also instead of four), activated by a single servodrive (usually two). After launch the SAM locks on the target

with the homing head's passive radar channel. As it closes with the target the signal level increases on the infrared channel and when it begins to exceed the radio signal, missile control switches to the IR channel. According to foreign press data, the RAM system will be able to destroy an antiship missile with a probability of 0.9.

It has been reported that in late 1981 the United States manufactured four experimental models of a 24-cell launcher, two of which were sent to the FRG for tests under shore and shipboard conditions and two were left for weapons testing. In the first phase (spring of 1982) the XRIM-116A missiles intercepted five drones above the earth's surface at the White Sands Range (see figure [figure not reproduced]). In the second phase, conducted at the Point Mugu Pacific Range from December 1982 through May 1983, direct hits on maneuvering targets--antiship missile simulators flying low over the water's surface--were noted. The Vandal drone target (launch weight of 1,590 kg, length of 6.7 m, wingspan 2.8 m, body diameter 0.73 m, flight speed Mach 1.65-2.8), which is a modified shipborne Talos SAM, was used as the target. A total of 12 intercepts were made. It is expected that a decision will be made in the spring of 1984 (after final tests, including for survivability) about beginning series production of the system.

The U.S. Navy plans to use this SAM system as a supplement to the Sea Sparrow SAM system and place five XRIM-116A missiles on its launcher in each of the two upper middle compartments. Aboard U.S. ships not armed with the Sea Sparrow the plans are, as in the FRG Navy, to use the ASMD with a 24-cell launcher, which weighs 4,975 kg together with missiles, has a 360° rotation (a clearance diameter of 3.07 m) and an angle of elevation from -25° to +80°. Some ships possibly will be armed with a simplified launcher with a small fixed positive angle of elevation.

The FRG naval command plans to procure 86 systems for installation aboard six new "Bremen" Class guided missile frigates (each with two launchers on the roof of the helicopter hangar), ten Type 143A guided missile patrol boats (one launcher in the stern), and three "Luetjens" Class guided missile destroyers during their next modernization, and aboard other ships.

The Danish naval command plans to arm "Niels Juel" Class guided missile frigates (with a displacement around 1,200 tons) with two ASMD systems with the lighter launcher (up to 2,270 kg). Each system will have a capacity of 8-10 missiles.

As the foreign press reports, when any ASMD launchers are employed against one target, initially two missiles will be launched simultaneously, but when the launcher is almost empty they will be launched singly.

The developing countries expect that high firepower and effectiveness, the small size and weight as well as short reaction time of the new system will attract the attention of navies of other western countries to it as well.

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## FOREIGN MILITARY AFFAIRS

### FOREIGN MILITARY BRIEFS

#### French Military Obligation Changes

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) p 91

[Item by Lt Col P. Simakov: "Changes in the Statute on Military Obligation in France"]

[Text] In May 1983 the country's parliament approved statutes on amending the law on universal military obligation (adopted in 1971). One of the first points (there are a total of around 30) envisages increasing the number of servicemen performing duty under short-term contracts (at the present time there are some 10,000 persons, including over 6,000 in the Army), especially those who will be in command positions in all combat arms, in airborne and mountain infantry units, and in those positions which require more lengthy training. In this regard it is planned to increase the term of service of this category of servicemen to 16-24 months. A new pay system and other benefits have been introduced as incentives for their performance of service.

In accordance with the provision of the law, the age of young men subject to call-up for active military duty is lowered from 19 to 18 years. A new principle for distributing them to military units and duty stations also has been established, and appropriate instructions were drawn up. In particular, the duration of a trip from the place of residence to the unit location will be up to one hour for 20 percent of draftees, around three hours for 60 percent and over three hours for the rest. As the French Armed Forces command believes, this will achieve a significant saving of money for travel expenses.

Measures of coercion were made more precise for those refusing to serve in the Army for religious and ethical motives. For example, work at war industry enterprises (a two year term) is provided as one of the civilian forms of military obligation, while more severe measures--criminal liability--will be applied for those evading duty in the Armed Forces and for deserters. It is planned to increase the number of positions for servicewomen in troop units and headquarters. The number of draftees in the military gendarmerie is to increase from 6.5 percent at the present time to 15 percent (more than 13,000 persons) in the future.

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## FRG Naval Exercise SEF-83/2

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) p 91

[Item by Capt 2d Rank V. Tomin]

[Text] An FRG naval exercise under the codename SEF-83/2 was conducted in the Baltic and North seas from 1 through 31 August 1983 with the primary objective being a blockade of the Baltic straits and defense of sea lanes in the North Sea.

Participating in it were up to 80 ships, patrol boats and auxiliary vessels of the West German Navy, the permanent NATO naval force in the Atlantic (destroyers and frigates from the U.S., UK, FRG, Canadian, Portuguese and Dutch navies) as well as aircraft of FRG naval aviation (Tornado's) and the air forces of Great Britain and Denmark (Draken, Buccaneer, Canberra).

According to the exercise plan, which had as its basis one of the provocative versions by which armed conflict is unleashed in the North European TVD [theater of military operations], the "enemy" was first to begin combat actions on the Baltic Sea. His surface and underwater groupings made an attempt to penetrate the strait zone into the North Sea to disrupt NATO sea lanes in this region. In response to this the FRG Navy in coordination with the aviation of other bloc countries organized a defense of the straits from the east and disrupted the "enemy's" intent.

The following problems were practiced during the exercise: formation of ship forces and groups and their deployment in areas of tactical assignment, combating enemy surface combatants and submarines on eastern approaches to the strait zone, escorting landing detachments and convoys in the North and Baltic seas, antilanding defense of islands, laying minefields and sweeping mines, antisubmarine, antiaircraft and antimotor-torpedo-boat defense of ships and vessels on the sea passage.

Naval actions for blockading the Baltic straits were conducted jointly with aircraft of the Danish and UK air forces both in hours of darkness and daylight. The hunting and killing of submarines was accomplished by ship hunter-killer groups and "Atlantic" land-based patrol aircraft.

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### Italian Self-Propelled Howitzer

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[Item by Engr-Col N. Mishin, candidate of technical sciences]

[Text] According to foreign press reports, Italy has begun production of the Palmaria 155-mm self-propelled howitzer (see figure [figure not reproduced]), developed by the firm of OTO Melara on the basis of the OF-40 tank. Its combat weight is 46 tons, it has a crew of five, a length of 7.4 m (11.5 m with gun forward), a width of 3.35 m and a height of 2.8 m.

The gun is mounted in a 360-degree traversing covered welded armored turret. The unit of fire includes 30 separate loading rounds with fragmentation-HE, illuminating and smoke shells. The maximum range of fire of a conventional projectile is 24 km, or 30 km for a rocket-assisted projectile.

A 7.62 mm or 12.7 mm machinegun is on a ring mount above the commander's hatch. Two four-tube launchers located on the sides of the front section of the turret are intended for laying smoke screens.

The Palmaria self-propelled howitzer is fitted with a 750 hp diesel engine. Maximum highway speed is 60 km/hr and it has a range of around 500 km. Negotiable obstacles are a 30° ascent, 1.15 m wall, a ditch 3 m wide, and a ford 1.2 m deep (without preparation).

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### American Aircraft Radio

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 2, Feb 84 (signed to press 9 Feb 84) p 92

[Item by Engr-Maj A. Dashin, candidate of technical sciences]

[Text] The AN/ARC-164 UHF radio is for radiotelephone communications between aircraft and with ground points. Judging from foreign press reports, it is installed in modern American F-15 and F-16 fighters. In addition, it is planned to be used to replace existing AN/ARC-27 and AN/ARC-34 radios as well as the obsolete AN/ARC-51 and AN/ARC-109.

The AN/ARC-164 is made entirely of solid-state elements, operates in the 225-400 MHz band and has 7,000 fixed frequencies with a 25 Hz spacing of which 20 are preset. The transmitter power with amplitude modulation of the carrier frequency is 10 watts (an increase to 30 watts is possible). The weight is 3-5 kg depending on the version used. The mean time between failures is 1,000 hours.

The radio consists of a transceiver, frequency channel indicator, and remote monitor and control unit. A version also is being examined which is a control

unit and a transceiver in a single assembly. One or two sets are installed in single-seat aircraft in such a version or as a transceiver connected with a remote control unit and frequency channel indicator. Elements of the radio can be accommodated in different versions in two-seat aircraft, such as one transceiver with two control and monitor units, two transceivers with two units and so on.

The AN/ARC-164 has various functionally complete assemblies (frequency synthesizer, emergency receiver, transmitter with modulator) made as subunits which are connected mechanically and electrically with the help of a flexible cross-plate and are fastened rigidly with four screws. A special adjusting adapter was developed for replacing old radios (it takes 5-15 minutes). It is not necessary to change the electrical wiring existing aboard the aircraft.

The foreign press notes that the AN/ARC-164 presently has been modified for its use in the HAVE QUICK system, in which there is an automatic pseudorandom stepping of the operating frequency to provide jamming resistance under ECM conditions. In this case the modernized radio is used together with synchronization gear installed in the aircraft. This gear includes a control generator with antenna, precision frequency generator, and standard power unit supporting the continuous operation of units during brief power outages.

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#### BK-117 Multirole Helicopter

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[Item by Lt Col V. Volin]

[Text] According to foreign press reports, the Japanese firm of Kawasaki and the West German firm of Messerschmitt-Boelkow-Blohm (MBB) have begun joint production of the new BK-117 multirole helicopter. In the opinion of many foreign military experts, it meets requirements placed on this class of flying craft.

The helicopter is intended for transporting personnel and cargoes (for example, it can carry 11 armed soldiers or a 106-mm gun) and, when fitted with appropriate weapons and equipment, for combating enemy tanks and performing aerial reconnaissance.

The BK-117 has the following combat characteristics: maximum take-off weight of 2,850 kg (over 3,000 kg with cargo on external attachment), maximum load of 1,375 kg, maximum flight speed at sea level of 278 km/hr, cruising speed of 257 km/hr, maximum rate of climb 9.3 m/sec, service ceiling 5,180 m, range of 545 km (with 800 kg of cargo), and maximum flight duration of 3 hours. The helicopter is 13 m long, 2.5 m wide and 3.33 m high. The diameter of the main rotor (four-bladed) is 11 m, and the tail rotor (two-bladed) is 1.9 m in diameter.

The power plant consists of two turboshaft engines with a shaft horsepower of 658 each in an emergency operating mode (duration of 2½ minutes), with maximum power setting it is 609 hp, and with rated power setting it is 558 hp. The fuel reserve is 480 kg (800 kg with two auxiliary tanks).

Parts production is distributed as follows between the firms. MBB will manufacture the main rotor and tail rotor, servohydraulics, rotor control system, power transmissions and certain other elements and assemblies which are identical to those used aboard the BO-105 helicopter, while Kawasaki will manufacture all air frame compartments (except for the tail boom), engines, control system in the fuselage, electrical equipment, and fuel system.

The firms plan to sell 500 BK-117 helicopters in the near future (of which 350 will be produced by MBB). Potential buyers include many NATO bloc member countries, including the United States as well as Australia, Indonesia, Malaysia and certain other states.

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#### New Computer for U.S. Navy

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[Item by Maj (Res) G. Svetanin]

[Text] The U.S. Navy command is giving constant attention to an improvement of control systems and equipment with which naval ships are fitted. In particular, in March 1983 the firm of Sperry UNIVAC was given a contract for \$500 million for the manufacture of the AN/UYK-44 computer (see figure [figure not reproduced]) over a five-year period. It is to replace the AN/UYK-20 presently aboard ships. The new machine is twice as fast as the old one and the capacity of its memory can be four million 16-bit words (it is 265,000 for the AN/UYK-20).

It is planned to produce a total of three versions of the new computer. The first is an independent electronic computer and includes all functional elements inherent to it. The second has only a new processor, and other elements will be the very same as for the computers of other types. The third combines the equipment of the two preceding versions and primarily will be intended for developing software in U.S. Navy scientific research organizations.

It is planned to deliver the first models of the computer to the Navy in November 1983.

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